CHICAGO TRACTOR MEETING REPORT

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The AUTOMOBILE

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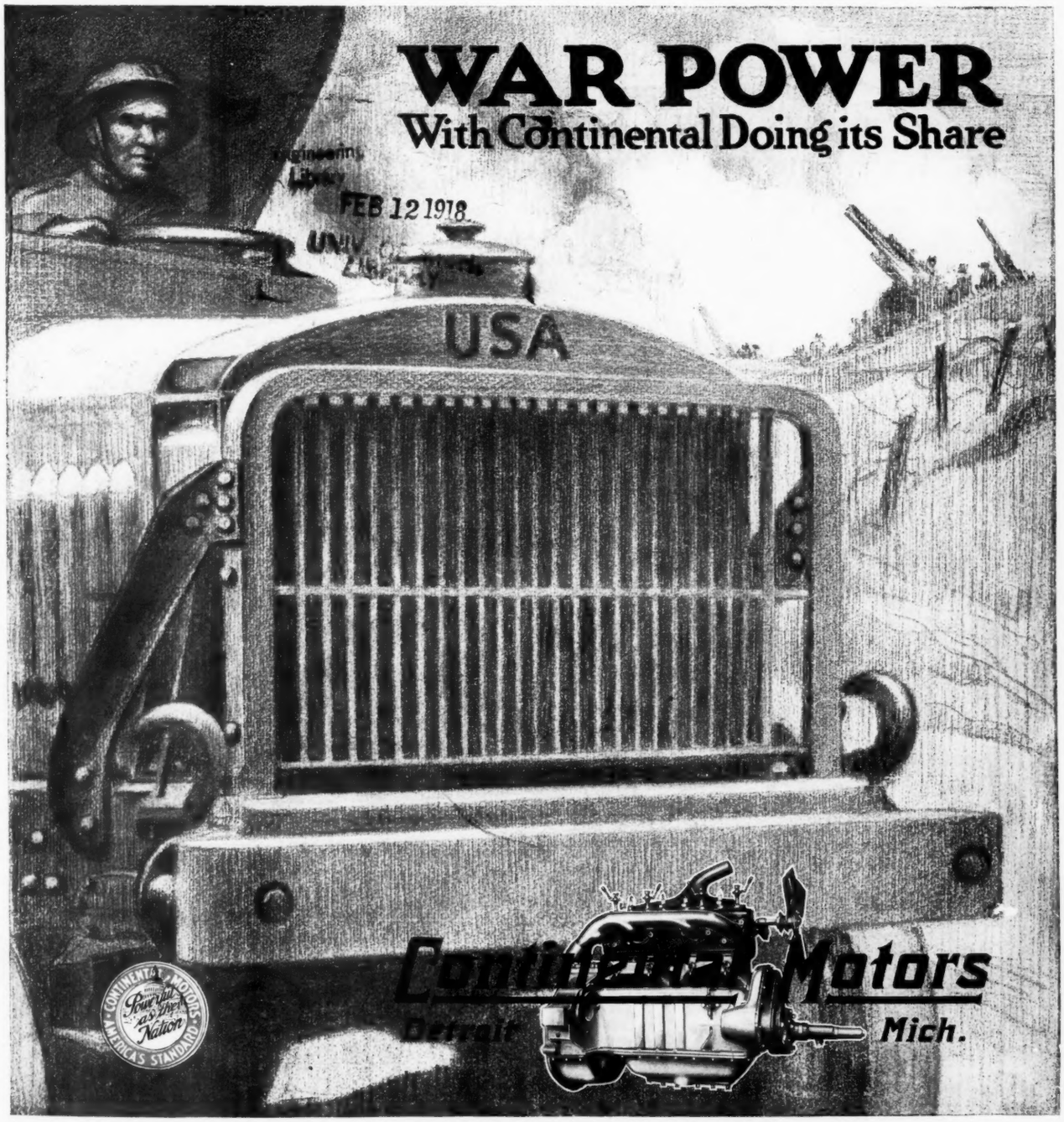

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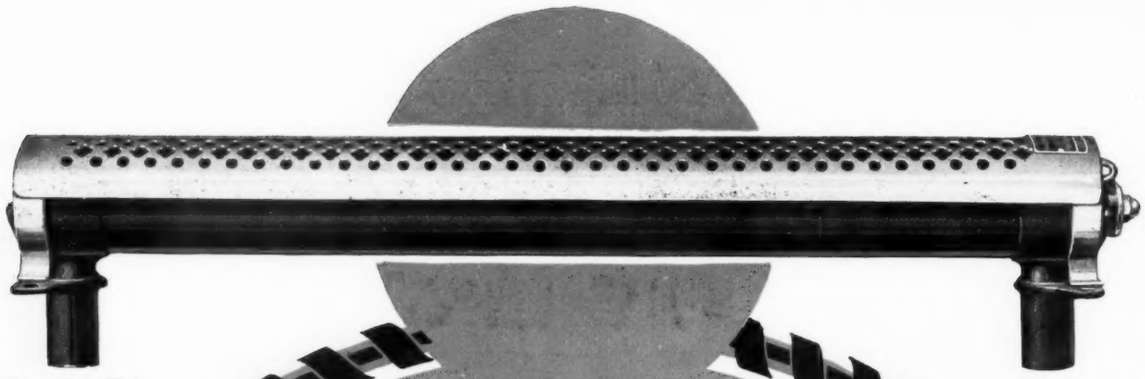

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AUTOMOTIVE INDUSTRIES
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VOL. XXXVIII NEW YORK—THURSDAY, FEBRUARY 7, 1918—CHICAGO No. 6

Tractor Problems Discussed at Chicago Meeting

Fundamentals of Tractor Design, Engine and Transmission Gear Design Dealt With—Industry Too Young to Permit of Rapid Standardization —Meeting a Success

CHICAGO, Feb. 1.—To-day's tractor session of the Society of Automotive Engineers marked one of the first real steps in advance in this department of the society's work since the broadening of its field to fully include all automotive products. Broadly speaking, the work accomplished to-day was more the laying down of a future program of development than an accomplishment of progress in engineering detail. The work of the S. A. E. to-day was the sketching of the outline into which the picture of future developments will fit as the industry shapes itself and becomes more mature. The registered attendance was 239.

As President Kettering said, "Not five per cent of the demand for tractors has been filled." The industry is in its infancy, and we know so little of the tractor and so little of the problem which confronts us that it would be absurd to attempt to deal with detail at this early date.

This feeling was common to the other engineers present, with the result that the broadest aspects of the tractor problem were considered. To again quote President Kettering, the tractor problem is fifty per cent engineering and fifty per cent psychology. Unless a tractor company studies the psychology of the farmer along with the engineering problems of the tractor itself, it will fail.

The program of the meeting included four papers on tractor service, tractor design, tractor engines and tractor transmission, presented respectively by George Cormack, Appleton Mfg. Co.; George Strite, consulting engineer; H. C. Buffington, Minneapolis Steel & Machinery Co., and E. R. Greer, Emerson-Brantingham Co. These four papers gave a well-balanced program and one which was worthy of a much longer time for discussion than was afforded by the brief three-hour session. Discussion was necessarily curtailed by the shortness of time, but what there was showed an interest which ranks as high as in any topic ever handled by the society.

George Cormack's paper on tractor service struck the true keynote of the meeting in departing from the mere technicalities of the subject and outlining with the broadness of the idealist the true purpose of the tractor. Cormack outlined the service that the tractor is to render this country in the time when agricultural products are such a vital factor in the welfare of the world. He spoke on the ethics of the manufacturer in forgetting the fact that he is primarily engaged in manufacturing for the purpose of making money rapidly.

In other words, tractor service means something more than the mere maintenance of the tractor in the field and in the repair shop. It means the broadest kind of service which can be rendered by machines which are built by concerns who do not put out a product in which quality is slighted and profit only considered. The author touched a responsive cord when he stated that manufacturers who have the good of their country at heart will not produce machinery which they know to be defective when this machinery draws from more worthy purposes the labor and material which are so sorely needed in these times.

The other three papers were concerned more strictly with the engineering phases of tractor development and fittingly rounded out the program so that President Kettering's estimate of the subject as 50 per cent engineering and 50 per cent psychology was reflected almost exactly.

Probably the biggest lesson in the engineering end of the program is held up for the attention of automobile manufacturers who are endeavoring to enter the tractor field. The differences in fundamentals between tractor and automobile engineering are so great that automobile men must bear them continually in mind unless they wish to waste vast sums of money in learning the lessons that are at their disposal if they will only recognize with an open mind the facts which have already been discovered by men who have studied the tractor field for the past decade.

As summed up by President Kettering, the tractor engineer must remember that the tractor differs from the automobile in one very important respect: "It will not coast for any appreciable distance when attached to three or four plows." When a machine is rated at 20 hp. it must deliver 20 hp. continually from one end of the day to the other. There can be no shirking on the part of the machine because when it is needed by the farmer it is needed badly and must run with or without attention so that it performs its tasks in the desired manner.

The War Dinner

The culmination of the program was in the war dinner held in the evening. More than 1200 were gathered at the biggest function ever held by the S. A. E. This war dinner was patriotic from its Hooverized menu to its highly patriotic speakers drawn from both military and civil life. A letter of greeting from President Wilson extending his appreciation for the efforts of the S. A. E. during the war and his hope for the best efforts of the organization for the future was read by H. L. Horning. A telegram of response to the President was dispatched to Secretary Tumulty asking him to present to the President the earnest wishes of the organization that the strength of the President should be reserved to carry the burdens of his great responsibility and to renew the pledge of the resources of the S. A. E. in aiding the government in attaining any ends that it may have in view.

The speakers were General Kener, commanding Camp Grant; H. L. Horning, and W. H. VanDervoort, who presided jointly; C. F. Kettering, president of the S. A. E.; Major W. G. Wall of the Ordnance Department, and a major attached to the French army. The speakers without exception dealt with the national problems in connection with the war and told how we are overcoming the great difficulties of raising within a few months an army that normally would require years to get together.

Volunteers for Ordnance

Captain Donaldson, of the Ordnance Department, asked for volunteers, during the afternoon meeting, for men to go to France as ordnance officers for all-around engineering service. He secured nearly twenty applications during the afternoon from men who are strongly interested in the tractor service and will probably have an increased number from the engineers in attendance.

No discussion followed the paper by George Cormack on tractor service, which was really as much a paper on manufacturing ethics as it was on pure tractor service. Mr. Cormack, in a short summary after he had read his paper, cited the fact that last spring tractor engineers in this country had received cablegrams from the other side asking for 35,000 to 40,000 tractors, and for information as to where to get them.

As a result of this, representatives of the largest tractor companies met and discussed the subject, with the result that it was necessary to reply that we could not furnish them at the present time owing to the fact that the industry was not developed to an extent where satisfactory machines are being produced. Certain companies had stated that they could furnish the machines, but in the final analysis their own engineers had refused to stand back of them.

George Strite touched on the demand for the highest power, on the part of the farmer. He said that even in the days of the big tractor pulling eight or ten plows the pressure and influence exerted by the customer for just a little more power was almost irresistible and the temptation was continually to build something larger, although sound engineering knowledge pointed out that the smaller machine was sure to come into favor. Mr. Strite dealt with the difficulty of clearly explaining horsepower to the farmer, and stated that power should be rated as in terms of displacement or simple pull in pounds.

H. L. Horning, in discussing this paper, stated that the matter of the standard Liberty tractor for government use had come up in Washington from time to time and it was proposed at one time to adopt the Ford tractor as England had done, and other types were also considered, but finally no standard was adopted. It was the consensus of opinion that the tractor is not old enough to standardize. We are just starting on an era of big things in the tractor work and we will greatly regret it if we try to go too far with standardization which will hamper future progress.

C. F. Kettering spoke of the differences between automobile engineering and tractor engineering, and stated that owing to the fact that the tractor is continually under full load it is necessary for the automobile engineer to entirely revise his ideas concerning engine performance. R. E. Davis of the Moline Plow Co. stated that automobile and tractor engineers could learn much from each other, and one point which should be particularly closely studied is that of the automatic lubrication of parts. The farmer will not stop to lubricate his machine, and so it is necessary to so design the bearing parts that oiling is of an automatic nature as far as it is possible to make it so.

There was no discussion on the papers by H. C. Buffington or E. R. Greer. Mr. Buffington touched on the essential points to watch in the design of tractor engines.

E. R. Greer dealt with tractor transmission. He divided practice into two main schools in which one favored the rough open gearing and large plain bearings as opposed to those who insist on inclosed gears with anti-friction bearings. He also stated that the question of wheels as opposed to other methods of traction is far from settled. In his paper, which is printed elsewhere, he states that wheels must be of sufficient size, and should be five feet or more in diameter with tractor of 8 to 15 hp. draw bar for general farm work. He stated that the standard type of truck transmission does not need tractor requirement, and with necessary reduction of from 30 to 100 to 1 it is necessary to use several reductions.

"Of all the problems we have to contend with to-day, the fuel problem is the biggest. There is nothing moved on this earth to-day except what is done with the sun's energy. This has been stored up in all forms in the earth and we have used it lavishly. Have we overdrawn our account? To-day there is arising a question: Can we go ahead? Must we curtail? It is the greatest question which confronts us, and yet we are not giving it proper consideration."—*President Kettering at the S. A. E. war dinner.*

Traction Transmissions*

No Uniformity of Practice in Tractor Transmissions Yet Discernible and Little Chance for Standardization at Present—Pros and Cons of Different Transmission Features

By E. R. Greer

WHEN we speak of a tractor transmission we generally mean the entire power-transmitting device, from the engine to the ground and including the pulley for belt work. Tractor transmissions are still in an early stage of development. They are composed of a number of groups of parts that are arranged differently in nearly every case, so that they cannot be classified without dividing them or making a special class for nearly every tractor now being manufactured.

There are differences of opinion among tractor men regarding many of the most vitally important features of tractor transmissions. Some believe in rough open gearing and large plain bearings; others insist on cut hardened inclosed gears and anti-friction bearings.

The question of wheels for traction versus the caterpillar is far from settled. The right size of wheels for wheel tractors seems to be further from being agreed upon than anything else, and it is one of the most important things in tractor design.

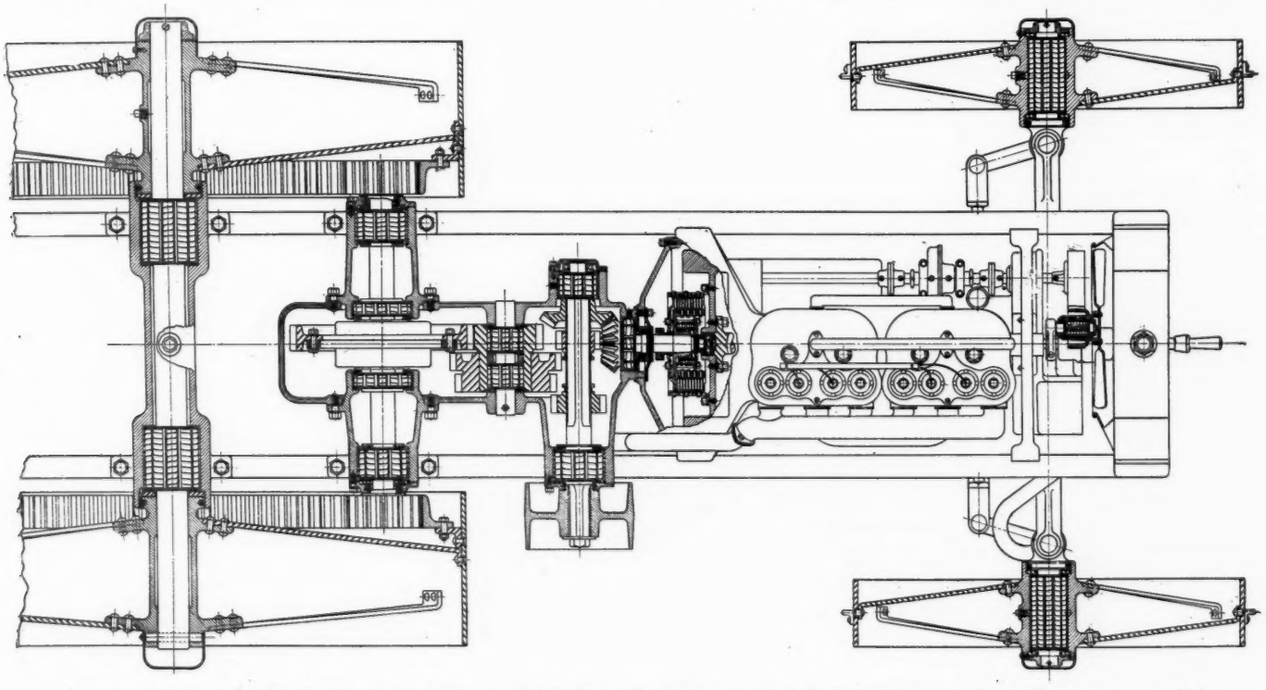
The design of a tractor transmission is affected greatly by the design of the wheels or caterpillar tracks which are to give the traction. The matter of traction is of first importance to a successful tractor, and it is right here at this point that opinions differ widely. The transmission design is largely affected by the decision as to the kind of traction to be used. The caterpillar with its large surface contact has an advantage on marsh land or sand where the top soil is tougher than the ground beneath. But it is at a disadvantage when just after a rain the ground is muddy on top and harder below. It can bridge a small ditch, but becomes blocked by one too large to bridge, and side hills or side draft cannot be taken care of as efficiently as when wheels are used.

Wheels must be simple and relatively inexpensive, and must be of sufficient size and provided with lugs to give good traction. For if a tractor wheel once starts to dig, it will not climb out of its hole unless the load is released. On smooth, hard ground a very small wheel gives efficient traction, but on newly plowed sandy soil or on land where there are washed out ditches a large wheel must be used. The matter of suitable lugs is of utmost importance. On some kinds of ground a spiral cleat at about a 45-degree angle will give double the tractive effort that can be obtained from the same wheels with straight cleats or spikes.

Large Reductions Required

For efficient general farm work with wheel tractors of 8 to 15 drawbar hp. the drive wheels must be 5 ft. in diameter or more, and the problem of the best way to drive the wheel is very important. The effort being applied to the

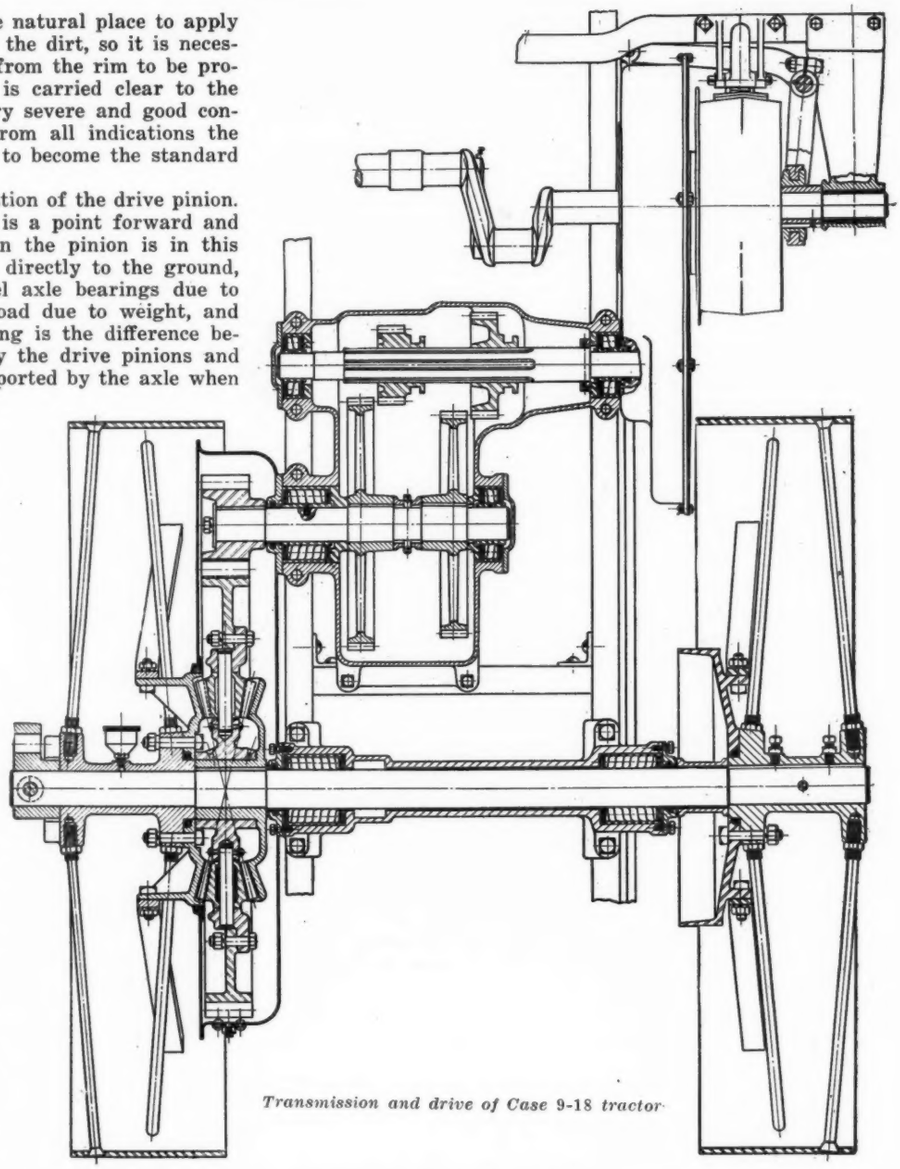
*Paper presented at the tractor meeting of the S. A. E., held in Chicago on February 1.



Plan view of tractor with four-cylinder engine, multiple disk clutch, two speed and reverse transmission and internal gear drive

ground, it follows that the rim is the natural place to apply the power, but the rim runs right in the dirt, so it is necessary to take some point far enough from the rim to be protected from the dirt. If the drive is carried clear to the axle the tortional strains become very severe and good construction expensive and difficult. From all indications the inclosed internal gear drive is likely to become the standard traction wheel drive.

The next important item is the location of the drive pinion. There is one best location, and that is a point forward and a little below the wheel axle. When the pinion is in this location the driving force is applied directly to the ground, so that the load on the drive wheel axle bearings due to power delivered is opposite to the load due to weight, and the resultant load on the axle bearing is the difference between the driving effort delivered by the drive pinions and the weight of the tractor that is supported by the axle when the tractor is standing. In other words, the drive axle bearings are practically floating when the tractor is pulling a certain load. At less load the bearing pressure is down and at greater load the pressure is up. The strain of the drawbar pull is carried by the drive pinion bearings through the pinion teeth to the drive wheel rim.



Transmission and drive of Case 9-18 tractor

Raising of Forward End

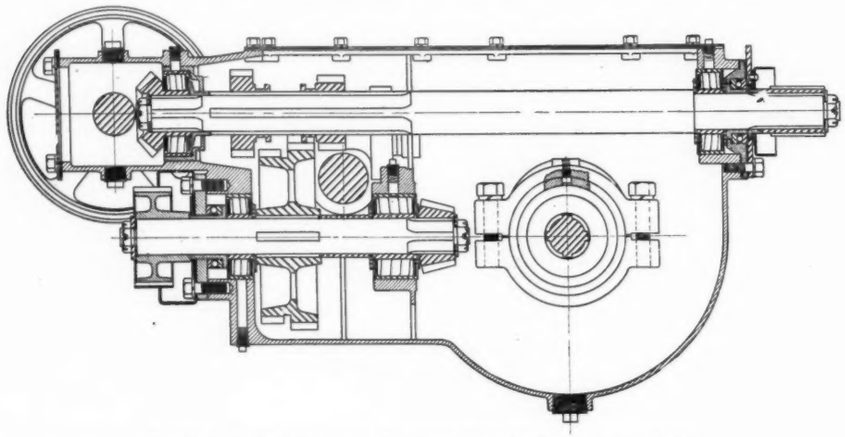
It is the lifting effect on the front end of the tractor that results in its forward movement. There are a number of tractors that have enough power to raise the front end clear of the ground so that the front end weight is the limit of their pulling power. These tractors are very difficult to guide and are of no use at all on hills. Enough dead weight must be carried on the steering wheels so that the tractor can be guided on the steepest hill.

The front wheel drive offers an easy solution for hilly ground, as in this case the reaction from the load is down on the rear steering wheels. There is no tendency to tip up, and the harder the pull the more positive is the control. The rear wheels must be ample to carry the additional load, and the difficulty is in arriving at a suitable arrangement to handle the implements when the front wheels are the drivers. While the steering mechanism may be complicated, the power transmission can be simple, the weight can be placed mostly on the drive wheels, and ditches and hills can be easily negotiated. The four-wheel drive immediately suggests itself, but the mechanical complication and expensive construction make it prohibitive.

Protection of working parts is not easily accomplished in tractor transmissions. An argument used by those who favor open rough cast gearing is that farmers cannot keep transmission grease or oil clean and that some grit is always put into the case at every filling. They claim that as long as parts cannot be kept clean, they wear out and may as well be made simple, open, and to operate without lubrication or when covered with dirt.

One unprotected drive known as "the roller pinion drive" has been quite successful on small tractors, as it can be made to last a season, is very cheap, and is easily replaced. Perhaps the worm drive can be taken as the opposite extreme, because the excessive tooth pressures, together with the vibration and dirt, have prevented its being a success no matter how carefully it is built.

As the users of tractors become



Vertical section through Emerson-Brantingham transmission

educated so as not to abuse their machines, then thoroughly protected, well-made parts will become more general. To-day simplicity is vital if a tractor is to be successful, but education is increasing the demand for well-made, efficiently protected parts.

A notable advance in tractor transmission design is that anti-friction bearings are becoming so widely used. It has been found that an ample, non-adjustable, anti-friction bearing may last indefinitely in tractor service. Transmission bearing trouble has been a common tractor fault in the past, and its elimination is a step ahead.

Shafting used is usually ordinary mild steel, as gears and bearings generally have to be of such size that the shaft sizes are ample. It is very important that splines be used instead of keys.

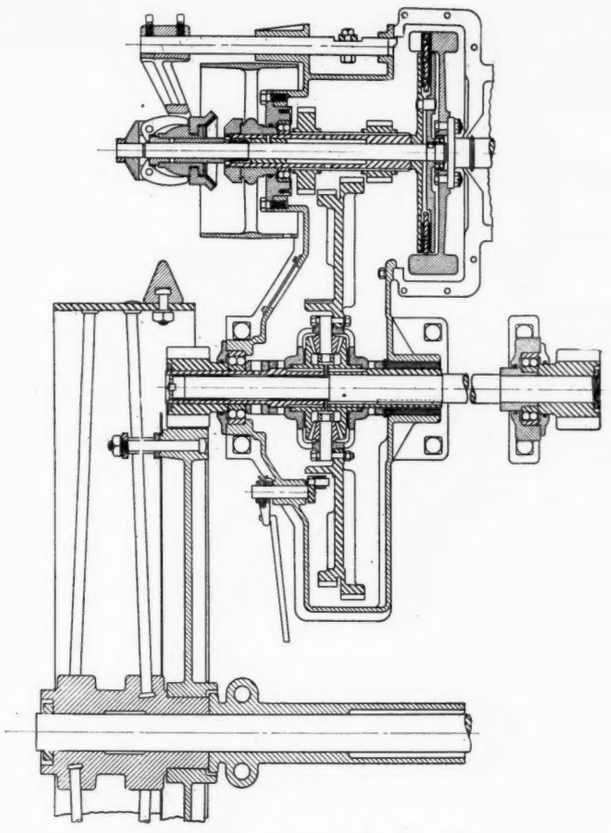
Truck Transmission Not Suitable

The standard type of automobile or truck transmission does not meet tractor requirements at all. The amount of gear reduction is too small, no belt pulley is provided for, the change speed is wrong, the parts are not ample, and it cannot be applied to a good tractor design.

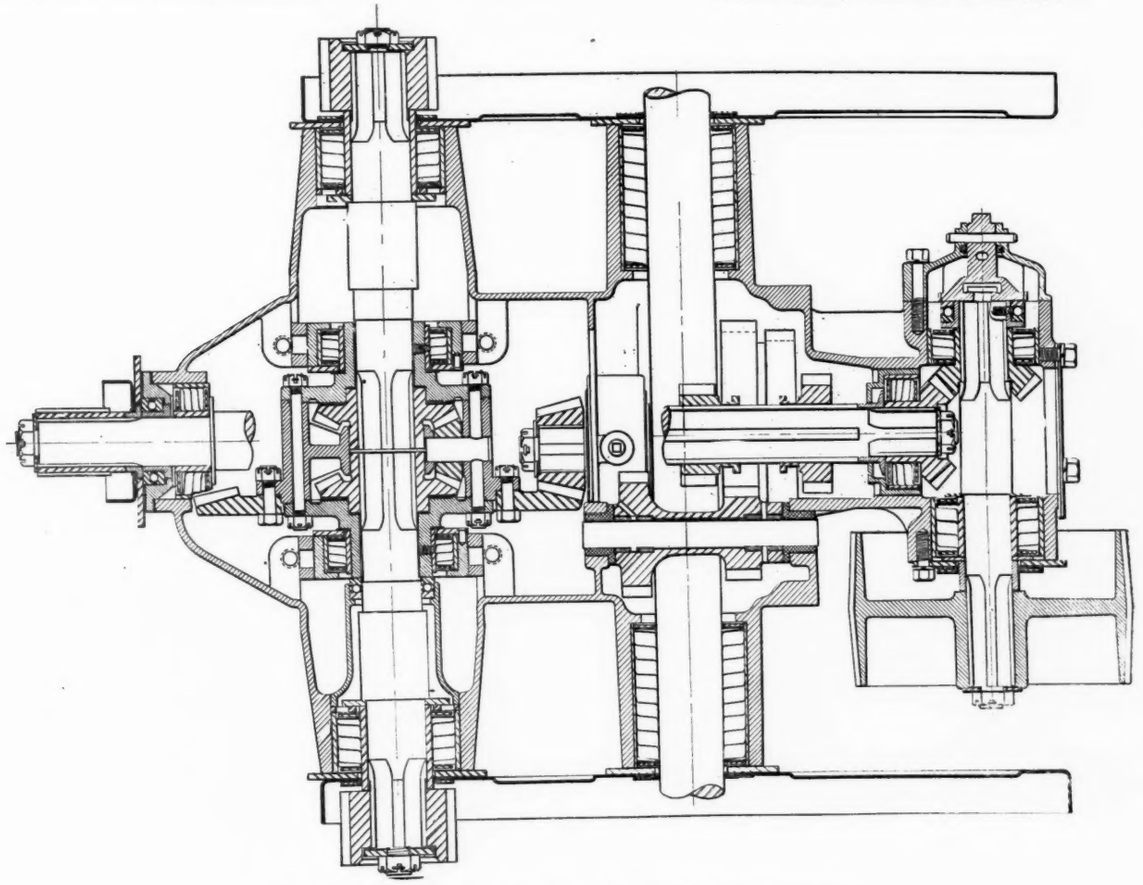
The total gear reduction in a tractor varies between 30 to 1 and 100 to 1, so several reductions have to be used. I think it is best to discuss each reduction separately and especially to consider the final reduction by itself, although in some cases entire transmissions are built as a single unit.

In general all tractor transmissions are driven from the engine through a friction clutch and without the use of universal joints, except that some clutches are designed to take care of any misalignment. Cone, disk, shoe, band clutches and friction drives are in use. The cone clutch and the internal expanding shoe clutch are most common.

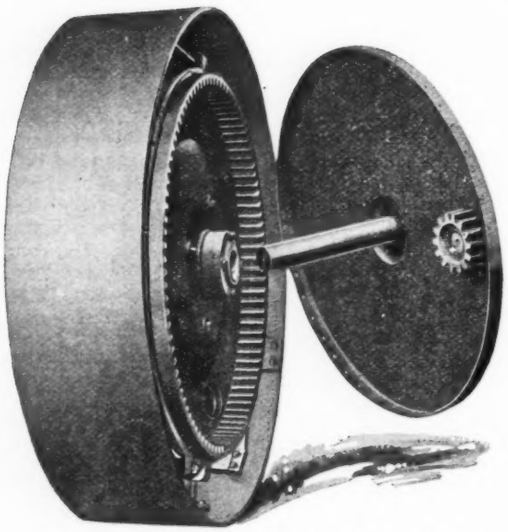
First reduction gearing may be almost any kind that one can imagine, and the amount of reduction from 1 to 1 to as much as 8 to 1. The change in speeds and the reverse are often worked in on the first reduction, but also it is very common to have the second reduction used for this. Where



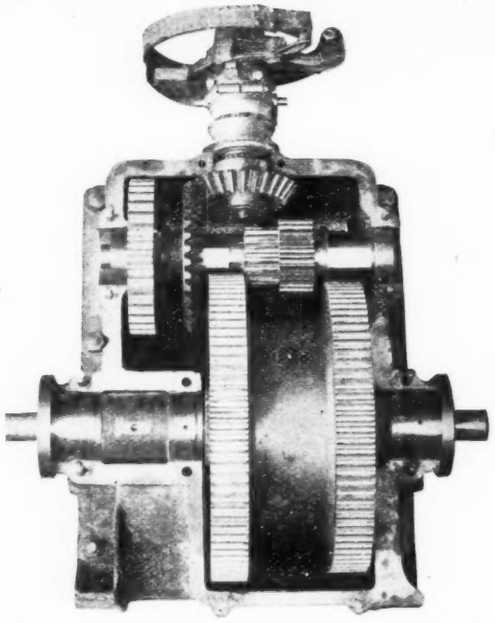
Parrett clutch, transmission and drive



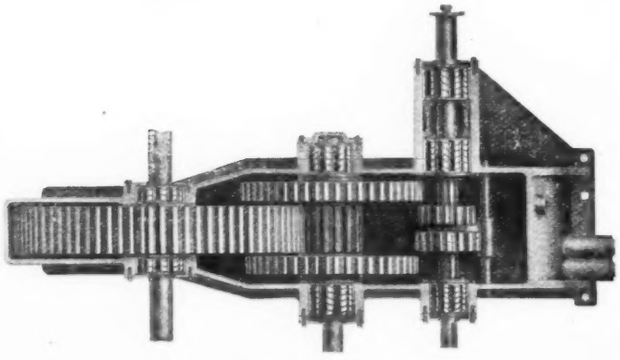
Horizontal section through Emerson-Brantingham transmission



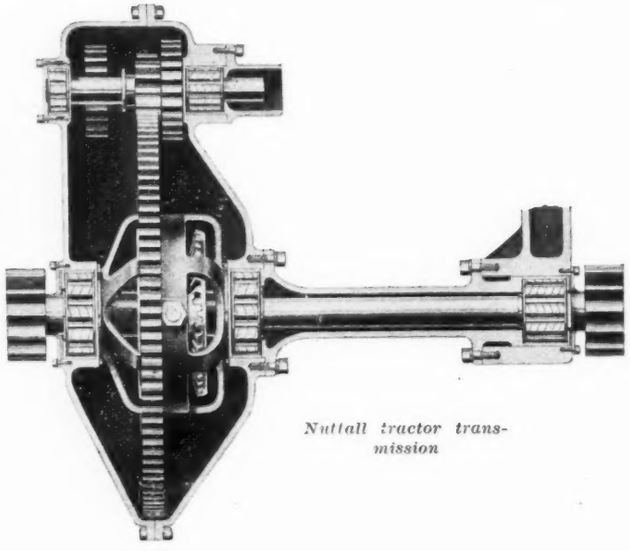
Minneapolis Steel & Machinery Co.'s internal gear drive



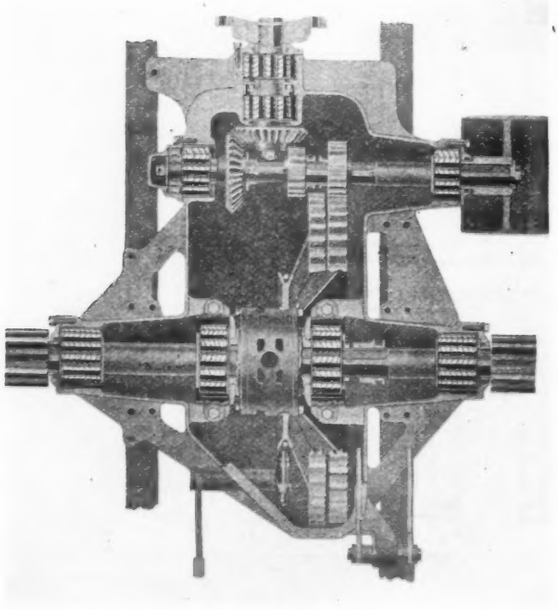
Minneapolis Steel & Machinery Co.'s clutch and transmission



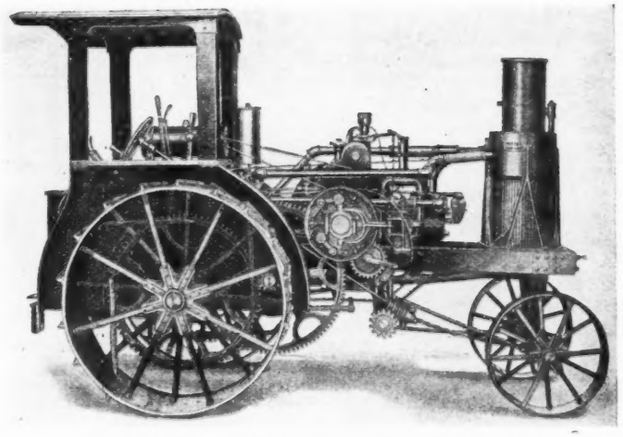
Transmission of the Gray tractor



Nuttall tractor transmission



Conventional tractor transmission



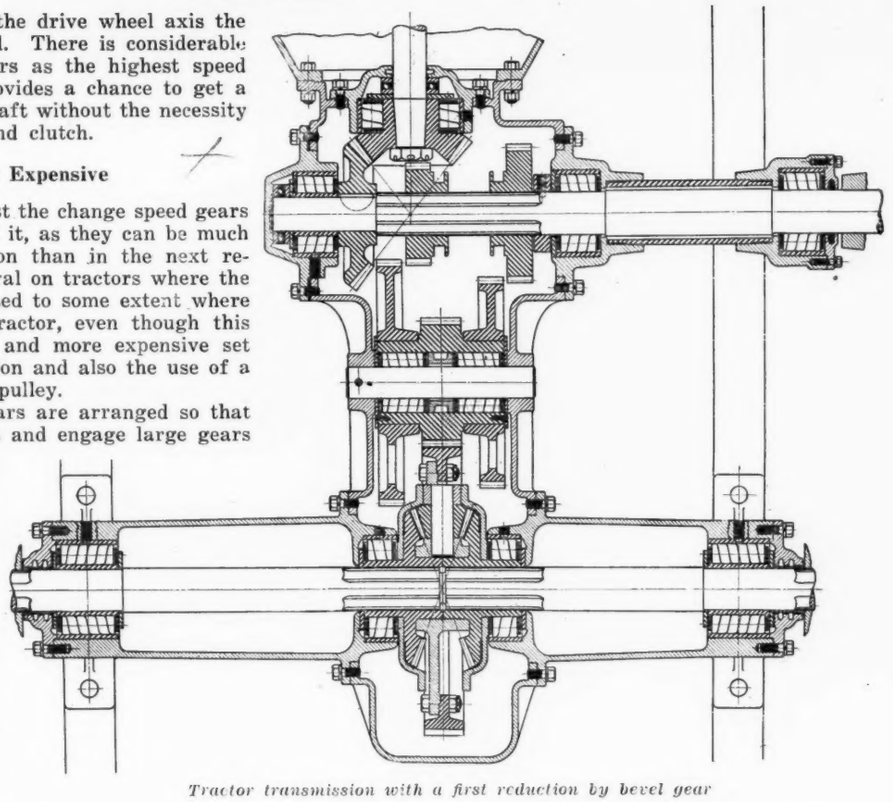
Avery tractor, showing large exposed transmission gears

the engine shaft is not parallel to the drive wheel axis the first reduction gears are often bevel. There is considerable advantage in having the bevel gears as the highest speed gears. It reduces cost and also provides a chance to get a belt pulley on a fairly high-speed shaft without the necessity of using a separate set of gears and clutch.

First Reduction Change Gear Least Expensive

When a spur reduction is used first the change speed gears and reverse are generally a part of it, as they can be much smaller and cheaper in this position than in the next reduction. This arrangement is general on tractors where the engine sets crosswise and is also used to some extent where motor shafts are lengthwise the tractor, even though this arrangement necessitates a larger and more expensive set of bevel gears in the second reduction and also the use of a separate set of gears for the belt pulley.

It is usual that change speed gears are arranged so that the pinions slide on the drive shaft and engage large gears on the driven shaft. No divided shafts or counter shafts, as are found in automobile transmissions, are used, except for reverse gears. This arrangement means that all gears are disengaged except the ones actually being used, and also that no idle gears or extra reductions are necessary for different speeds. Another advantage in this arrangement is that all change gears are disengaged when the belt pulley is to be used. Tractors are used for belt work for long continuous runs and gears or shafting running idle are undesirable because they waste power.



Tractor transmission with a first reduction by bevel gear

The second reduction is sometimes the final drive, though this is not often the case. Usually it is the drive to the shaft which carries the differential. If the differential can be placed in this position, ahead of the last reduction, considerable expense can be saved because the parts can all be made much smaller.

Differentials have to be very strong and ample, as tractor wheels are always slipping and keeping the differential parts working all the time. Differential locks are considered good practice. Brakes for holding one side for short turning are often used, but brakes for stopping, while necessary, are not very important.

In cases where more than three gear reductions are used the extra reduction is used either to gain compactness or to provide for some special arrangement of parts.

Number of Speeds Provided

Tractors are used for plowing a large per cent of the time, and generally are operated at from 2 to 2¾ m.p.h. Many have only a single speed, but most of the late designs have two or three speeds. When there are three speeds one is lower and one is higher than the plowing speed, and when only two speeds are provided the second speed is usually slower than that for plowing. The difference between speeds is nearly always between 30 and 40 per cent.

A tractor transmission is really a series of compromises, each part being affected by those related to it, so it is no wonder that there is such a difference in design. A difference of opinion as to the proper location of the belt pulley alone will very materially affect the entire transmission arrangement. At present there is little chance of valuable transmission standards. It will require more time and many tests to prove what is best.

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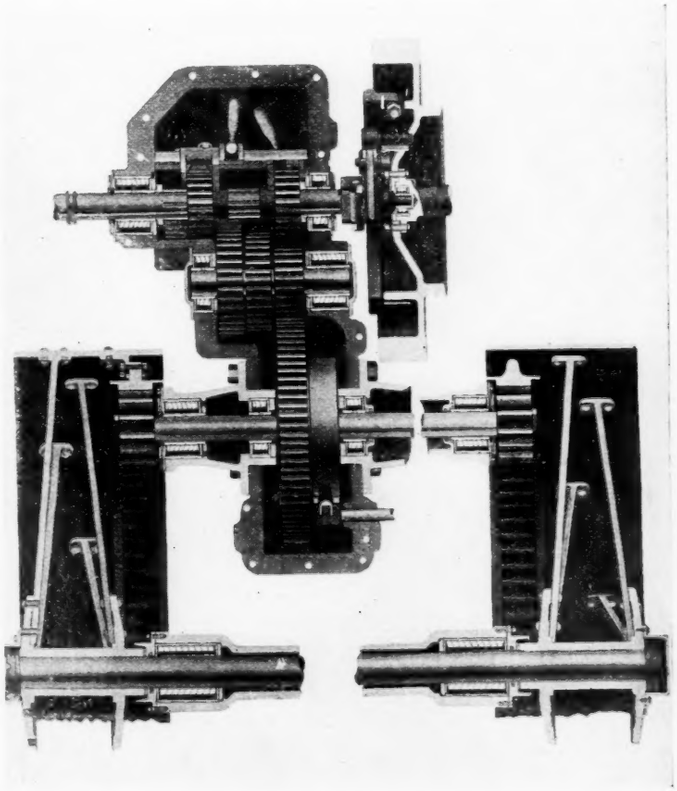
SOME time ago it was announced that a successful incombustible substitute for celluloid, manufactured from soya bean cake, had been discovered in Japan. Further particulars of the new product have come to hand. It is called "Satolite," after the inventor, Professor Sato, and a company for its manufacture has been started with a capital of £200,000. Satolite is a galalith made of the glucine of soya bean, coagulated by formalin. It is said to be produced much more cheaply than celluloid.



Three speed transmission and internal gear drive of the Waterloo Boy tractor

Fundamentals of Tractor Engine Design*

Substantial Crankshafts, Liberal Bearing Surfaces, Removable Cylinder Heads, Voluminous Water Spaces, Long Strokes, Conservative Rating as Kerosene-Burning Engines, Force Feed Lubrication and the Greatest Possible Accessibility Among Features Advocated

By H. C. Buffington

So much has been said about the fundamentals of tractor engine design that an attempt to write upon the subject at this time, when the tractor is undergoing such rapid changes, is apt to incite derision. However, we all have our own ideas, gathered from experience, and the only way to be convinced as to whether or not we are right is to express ourselves publicly.

"Fundamentals of Tractor Engine Design"—the subject seems simple at first thought, and immediately the general outline of a four- or six-cylinder engine flashes through one's mind. We picture a smooth iron-clad masterpiece solidly mounted upon the frame of a racy looking tractor. We do not at first consider the carbureter, magneto and all the other contraptions necessary to make it run.

Presently we ask ourselves, What are the essentials of a successful tractor engine; what have we gathered from actual experience and not from theory? What the writer has in mind is not an engine of higher speed and light construction, nor a heavy two-cylinder engine, but a four-cylinder one with certain elements of construction which have proved their worth, and these elements of vital importance are the ones which the writer wishes to dwell upon.

Crankshaft

The crankshaft being the essential element around which the engine is constructed deserves first consideration. Too often this part has been neglected in the fight for lightness and cheapness; the following proportions, however, have shown up well under trying conditions. Personally the writer prefers the three-bearing shaft. There are, however, some points in favor of the two-bearing type, in that the two center cylinders can be placed close together, and, of course, the doing away with one bearing is an advantage. On the other hand, a very heavy shaft is necessary, and, generally speaking, the three-bearing type is best suited for large engines.

The crankshaft stress should not exceed 12,000 lb. per square inch, with an explosion pressure of 300 lb. per square inch. This will give a good solid shaft free from vibration, which is so destructive to bearings.

Bearings

A good proportion for the crank pin bearings is to take 57 per cent of the cylinder diameter for the pin diameter and 1.2 of this diameter for the length. This will give a projected bearing area of half the cylinder area, thus keeping the pressure down to 600 lb. per square inch. The main bearing pressures should not exceed 400 lb. per square inch for the front bearing, 400 lb. for the center and 250 lb. for the rear, taking the center of the bearings as the points of reaction. You will note the rear bearing pressure is very low, but this is necessary to take care of the extra pressure caused by the transmission shaft, if it happens to be out of line with the engine, which is often the case.

Removable Head

Whether ell-head or valve-in-the-head is rather a matter of choice. Those who prefer the ell-head perhaps use it because, as I heard it expressed, "It is a good old family horse." On the other hand, the valve-in-the-head is chosen

*Read at S. A. E. tractor meeting, Chicago, Feb. 1.

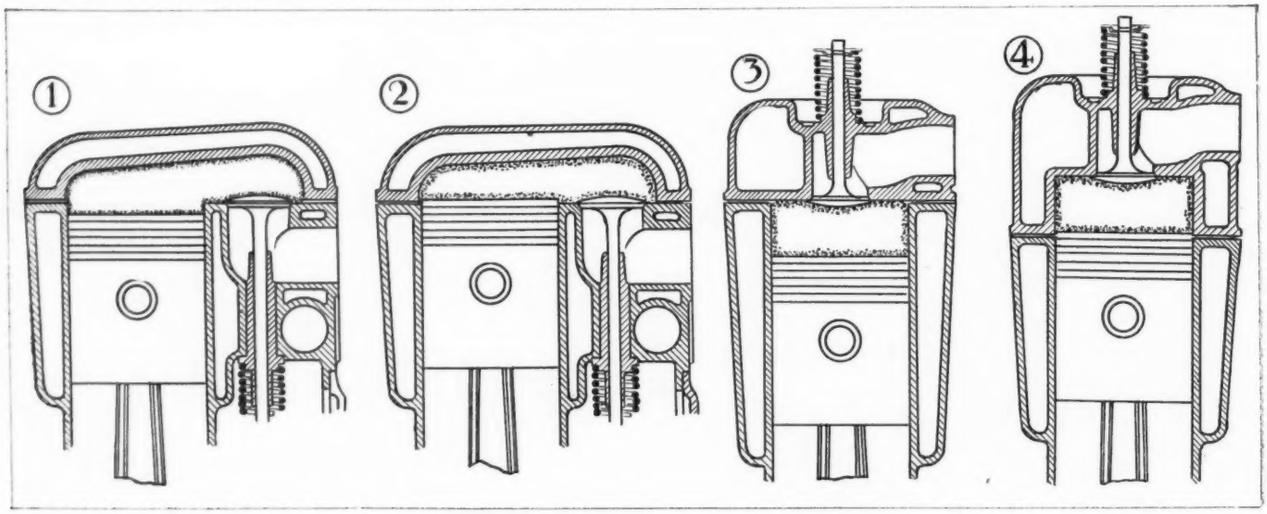


Fig. 1 Fig. 2 Fig. 3 Fig. 4

by the more particular who do not want to be outdone in points of efficiency. The removable head, which has been recognized by a great many engineers as a necessity, has not been appreciated by some. There are several important reasons why the removable head should be classed as essential, i.e., cleaning carbon, grinding valves, doing away with the troublesome valve cover plug, or valve cage and making it possible to adjust the compression for high altitude. The cylinder head should part on a line with or a little below the top of the piston, and not above, as the latter method makes it harder to clean and the piston cannot be removed without first removing the carbon from the cylinder walls. Figs. 1, 2, 3 and 4 show this difference. The difference in compression can also be taken care of much easier. There are many tractors working in altitudes as high as 8000 ft., and the changing of the head is a simple matter as compared with the changing of pistons.

Water Jackets

Liberal water space around the head should be given very close attention, as, unlike the automobile engine, a maximum load must be expected for a period of hours. An even thickness of combustion chamber walls is very essential for the same reason, and means for checking up the thickness should be very seriously considered. If, for instance, there be a hot spot in one cylinder, the carbureter must be adjusted for that cylinder or the result will be very disastrous. There will then be either preignition in one cylinder or excessive fuel leakage by the other three pistons.

Long Stroke Preferable

Theoretically, a tractor engine should not be pulled down below normal speed, but this is often done; in fact, at least 50 per cent of the time the operator will have his engine overloaded, and it is for this reason that the stroke should be at least 1.4 the cylinder bore. The long stroke engine is also very desirable, because with it the difference between the engine speed and final drive is not so great and permits of holding down the transmission gear diameters.

The transmission itself has a great deal to do with the necessity of flywheel capacity, and the higher the efficiency of the transmission, the greater should be the flywheel energy. The less efficient transmission acts as a shock absorber and lessens the shock on the crank pins, while, on the other hand, the shock is transmitted almost directly to the crankshaft. It can readily be seen why some engines with a small flywheel do not have half a chance to stand up. In calculating the flywheel, double the horsepower should be taken with 10 per cent variation in speed. The speed control on the engine should be about 10 per cent above normal.

Engine Rating for Kerosene

Engine rating on kerosene should be based on 800-ft. piston speed, and this rating should not be over 75 per cent of its maximum capacity on gasoline. Actual laboratory tests have shown the power output on kerosene to be within 8 per cent of that on gasoline, but under actual working conditions it is not practical to expect this.

A tractor engine before leaving the test block should not use more than one pint of kerosene per horsepower-hour when pulling its rated load. This fuel is to have a gravity not lower than 42 deg. Baume, and an open flash point of not over 120 deg. F.

Engine builders to-day are at a great disadvantage in not having a standard fuel with which to develop their engine. I wish to suggest that the S. A. E. establish a standard kerosene and a standard gasoline.

Manifold Head Control Essential

One reason why it is difficult to successfully run tractors on kerosene in the country is that the grade of kerosene used in small towns, which may be termed lamp oil, although its specific gravity is not so low, has a very high open flash point, and to use it in engines it is necessary, in order to vaporize it, to heat it to a very high temperature. This high temperature, of course, reduces the power. This fuel gives a very good light and there is no danger from explosions, but it costs more than the so-called distillate, which in most cases is an excellent fuel.

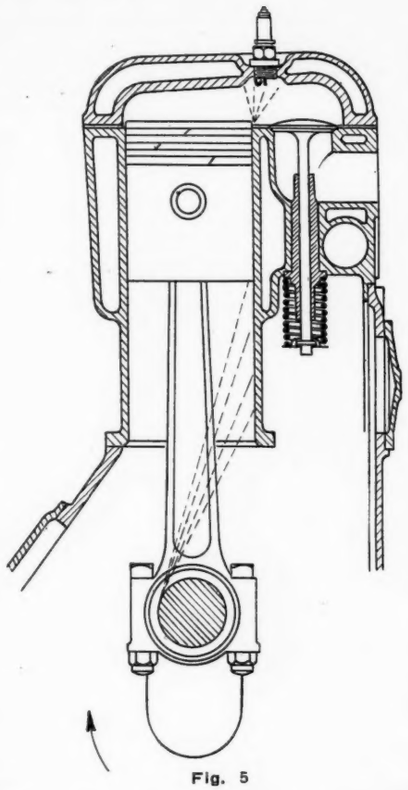


Fig. 5

This point pertaining to difference in fuels is mentioned merely to point out the necessity of controlling the heat between the carbureter and cylinders, and it is very essential.

The writer has often been advised as to the location of the spark plug, but after many experiments and sad experiences it has proved that the trouble is due largely to lubrication.

Proper spark plug location without a doubt would cure 50 per cent of the magneto troubles, and yet engines are designed without attempting to determine the proper location of the plug. Without hesitation the designer will place it over the intake valve on an ell-head engine or on the intake side of the valve-in-head type. Spark plugs should not be placed near the line of cylinder bore where oil from the piston will splash on the plug (see Fig. 5) or in line with the intake gases when using kerosene as fuel. A careless operator will either use too much fuel or too much water with the fuel, and with the plug directly in the path of the gas flow this will cause improper ignition.

The direction of crankshaft rotation will sometimes make it necessary to shift the plug to the opposite side, as the excessive oil thrown from the crankshaft will always lodge on one side of the cylinder (see Fig. 5). If the plug is on this side it will become fouled much quicker. Placing the plug over or near the exhaust valve has often been criticized, but aside from the fact that the spark plug itself will have to be replaced more often, it is the most reliable position.

Lubrication

Lubricating the tractor engine is the hardest problem in engine design at the present time, and it will continue to be so until a better method of using kerosene as fuel is employed. A most excellent oiling system has been developed for the automobile; in fact, it is as nearly perfect as anything that could be produced, but it has turned out to be a miserable failure when an attempt is made to use kerosene under actual working conditions in the field.

We dislike to throw lubricating oil away, and before doing so every effort should be made to prevent it, but, figuring from an economical standpoint, it is cheaper to use the lubricant only once and let it drain from the crankcase than it is to cause the destruction of the engine by too great economy of oil, as time is lost in making adjustments and repairs which are caused by the used-over oil, as it gradually becomes thinned by the fuel passing the pistons. The most reliable method of lubrication is to force fresh oil to each moving part, crank pin bearing, main and camshaft bearings, gears and cylinders and drain it into a reservoir from where it is drawn from time to time.

Every care should be taken to clean the air drawn through the carbureter and breather, as the oil supplied the crank pin must pass through a drilled hole, and any dust entering

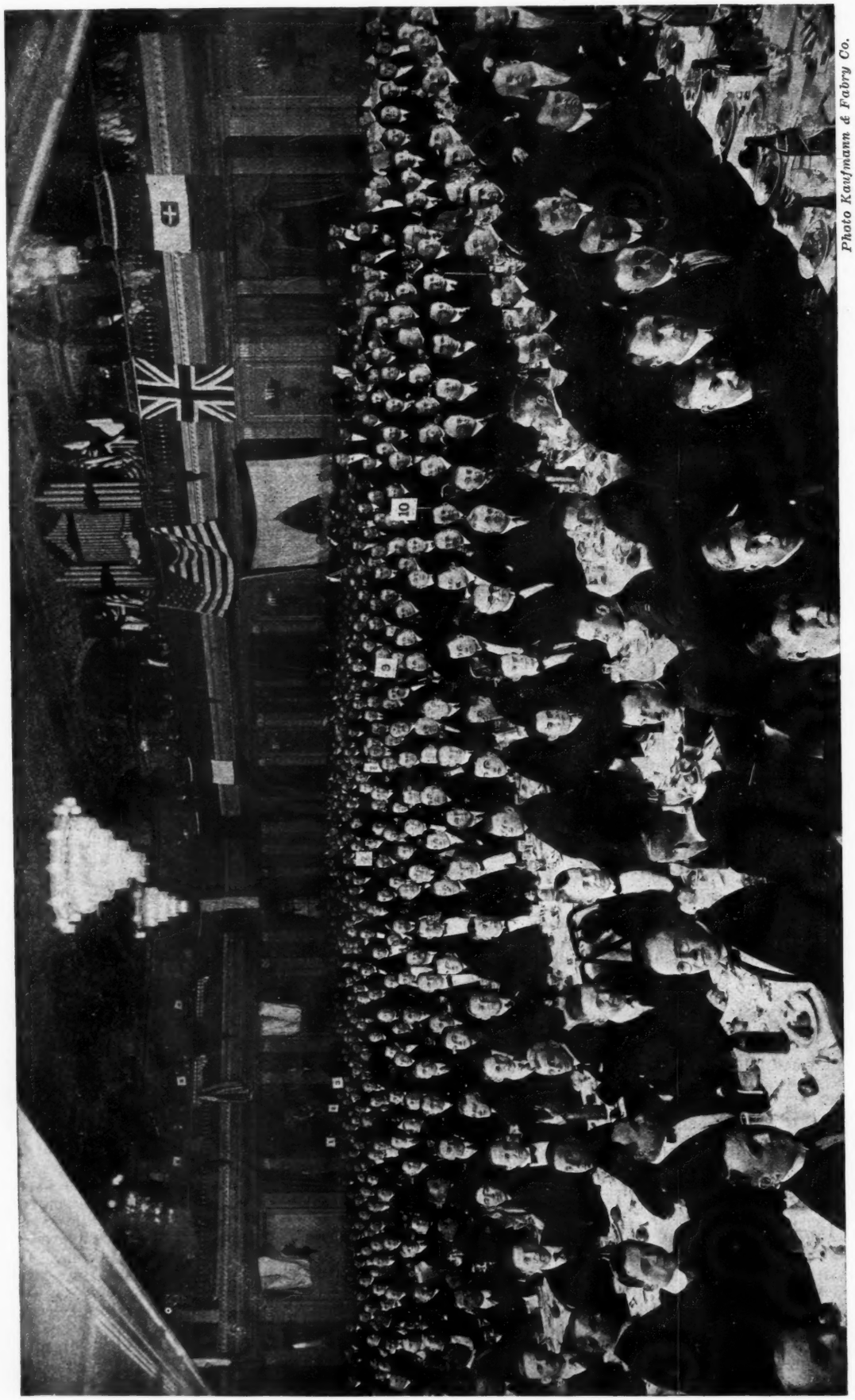


Photo Kaufmann & Fabry Co.

War Dinner of the Society of Automotive Engineers at the New Morrison Hotel, Chicago, February 1, Which Was Attended by More Than 1200 Persons

the crankcase will gradually clog the passages. Any other method where oil is used twice, whether forced or splashed, will cause rapid wear. This is not the case with carefully operated engines, but we cannot expect unusual care from the average operator.

Accessibility

Hand holes placed in the side of the crankcase to make it possible to inspect the bearings are quite necessary, and the base pan should be light and easily removed. Every effort should be made to make it easy to remove wearing parts in making repairs and avoid crowding small nuts into corners and out-of-the-way places.

In conclusion I wish to say a word to the tractor designer on a subject which, though not relating to the essentials of engine design, is essential to the success of its operation.

Every effort should be made to provide accessibility to the engine, not only on the carbureter side but on all sides, and especially should sufficient clearance be allowed underneath. Allow plenty of room for removing the base pan; avoid, if possible, fastening tractor parts to cap screws and nuts used in fastening engine parts, especially the cylinder head bolts, as this only tends to discourage the operator in making necessary adjustments.

I cannot lay too much stress upon the importance of flexibility between the engine and the transmission drive shaft. It has been necessary to provide extra large bearings at the flywheel, to take care of vibration caused by the transmission and engine shafts being out of line, but this destructive feature can be remedied. I suggest designing a self-contained clutch mounted upon a stub shaft bolted to the flywheel flange bolts, and also a flexible coupling placed between the clutch and transmission. This construction not only takes the extra pressure off the crankshaft, but also allows the transmission bearing to run freely (see Fig. 6).

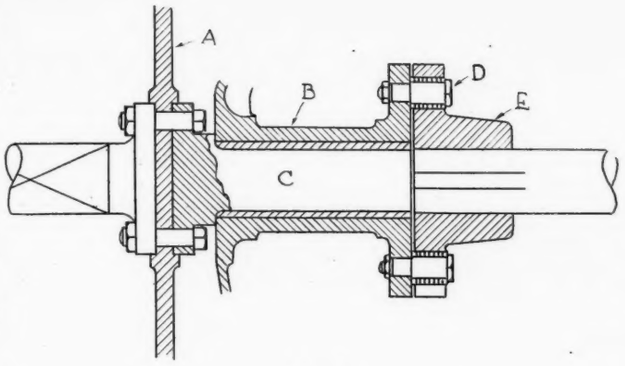


Fig. 6

War Problems Outlined at Automotive Dinner

CHICAGO, Feb. 2.—The war dinner of the Society of Automotive Engineers, held last night in connection with the tractor session, takes first rank as one of the most notable ever held by the organization. The attendance exceeded 1200, the banquet hall of the New Morrison Hotel being filled to overflowing.

The meeting opened with a letter of greeting from President Woodrow Wilson, expressing his hope that the organization would lend every effort to the great tasks ahead. General Kener, in command of Camp Grant; C. F. Kettering, president of the S. A. E.; Major W. G. Wall, of the Ordnance Corps, and a major attached to the French army were the speakers. The dinner was presided over jointly by Past-President W. S. VanDervoort and H. L. Horning.

C. F. Kettering's talk was the feature of the evening. In this he outlined the scope of the future work of the S. A. E., particularly in reference to the tractor field.

Major Wall spoke of the accomplishments of the Ordnance Department during the past nine months, and gave detailed figures on the munitions produced under the direction of this department.

General Kener spoke of the great necessity for man power and universal military training, and the major of the French army traced the progress of the military industries of France since the beginning of the war. Both W. S. VanDervoort and H. L. Horning spoke of the great work of the civilian experts in government work in Washington and also of the notable achievements of the members of the S. A. E. who are now enrolled in the Officers' Reserve Corps.

Past-President VanDervoort told how the Government is looking to the S. A. E. for so much of the Government work, and how proud the organization should be of such men as Howard Coffin, W. G. Wall, Howard Marmon and many others.

He bitterly spoke against what he called the "greatest of criminal errors" in not permitting the country to prepare during the three years that the other nations were at war. He stated that the criticism of the administration now going on is untimely, and that now is the time to uphold the President and not to criticise him. He said that a great work is being accomplished in doing in a few months what Congress should have had done during the last three years.

VanDervoort said that this is not the time for labor to talk of a certain number of hours' work, such as 8 hours or 7 hours, but now is the time to lengthen the period of labor only by the strength of physical endurance.

The men in the trenches need our support at home, and if we are privileged to have all the home comforts to which we are accustomed we should more than do our share in the tasks at home.

Major W. G. Wall told how the appropriations for the past few years for the Ordnance Department were inadequate, and hence this department was greatly unprepared until the beginning of the war. The Ordnance Department for this reason was up against a task the equal of which had never been known. Munitions for 3,000,000 men had to be prepared in 18 months. It is a big engineering problem.

Much of the material had to be made new, and some of it interchangeable with French—for instance, the 75 mm. and the 155 mm.—and necessarily there was some little delay before this could be brought into line for manufacture.

The greatest problems are the big guns and howitzers. It takes 9 months to complete one of the large guns, and the machinery to make them had to be built.

There are now eight large forge shops and many machine shops working on these, so that by next fall we will have more than 8000 cannon. Besides this there are thousands of the Enfield and the Springfield rifles which are the best rifles in the world.

There are ten large factories making the four-wheel drive units which are fitted with all types of bodies. A thousand of them, for instance, have machine shop bodies and others have gasoline tanks, anti-aircraft guns, etc.

In addition there are a number of types of Government trailers. There are 9000 tractors of caterpillar type in construction weighing from 18 tons down.

What the Automobile User Is Demanding*

How the War Is Affecting the Demand for Passenger Cars—Higher Weight Efficiency, Lower Fuel Consumption and Easy Starting in Cold Weather Called For

By J. Edward Schipper

THIS is war time. Even though we are more than 3000 miles from the nearest battlefield, the fact that we are at war is carried home to us in practically every activity of our daily life. The war has its influence on our business regardless of what it is. It has its influence on our home life, and naturally it has its influence on our mode of transportation.

The business man of America depends upon his automobile for quick transit. In one or two of the largest cities of the country he is not permitted to use it to the extent that he should. The horse had such a long start on the automobile that our cities are still horse cities and not automobile cities, in spite of the fact that our municipalities have neglected to consider the question of the proper handling of automobiles during the business day. The parking problem is on the hands of every police department in the country, simply because the cities of America, and in fact cities of the world, are horse cities and not automobile cities. Nevertheless, the business man of America is using his automobile to such an extent that it has become a necessary part of his business life in spite of the fact that he is compelled to put up with inconveniences in the way of parking and storage during the business day.

Since the automobile is a part of the business life of every executive in the country, whether the business over which the executive has control is large or small, whether it concerns the welfare of an entire organization, or whether it only has to do with his own personal business, the war has touched his best means of transportation and is a vital factor in the matter of what the automobile user is demanding of the automobile manufacturer to-day.

War Consumes Metals

The war is like a gigantic metal whirlpool into which metals are drawn from all over the world to find their way into the guns and into the thousands of other war instruments which are necessary in the carrying out of a modern battle.

Many of these metals and many of the other materials used in the construction of motor cars are used at the front, and many of the other metals and other materials which are used in the automobile are necessary to the factory which is making munitions for the front, and so the question of materials becomes one of prime importance in the automobile of to-day.

This may seem like a matter which is entirely up to the car manufacturer, and yet it has as much to do with the consumer as with the maker of the car. In spite of the fact that cars are increasing in price almost from month to month, the demands of the user for performance are also increasing from month to month. While the average price of automobiles has gone up several hundred dollars, if we leave out of consideration for the moment the very lowest price cars, the average price that the user wants to pay has not gone up nearly as much as the price, and therefore we see performance, which was formerly expected only in the higher priced cars, demanded as a matter of course from cars which at the present time do not cost nearly as much.

No one knows better than the automobile manufacturer that the car buyer wants performance. The carbureter manufacturer is familiar with the same thing. He knows that the public is demanding that he produce an instrument which is capable of throttling to speeds hardly in excess of two miles an hour and upon application of the throttle of picking up rapidly and surely to speeds in excess of 50 m.p.h. on fuels which are forever going down in quality and volatibility. What does the average user demand? He wants a car that does not cost him too much, in the first place; he wants a car which will be tied up in the service station for the minimum amount of time. It is a matter of pride with every user that his car is dependable, and it is a matter of necessity with most users that the car will be able to perform more than 300 days a year without a falter. If we took an average of all the users in the country, we would probably find that there is a demand for 15 miles to the gallon of gasoline; that there is a demand for quick acceleration, good hill climbing, easy gear shifting, comfort in the seats and springs, accessibility for small adjustments and repairs, a minimum, or rather an absence of rattle, and when it comes to tires, anything short of 8000 miles is always occasion for a fit of peevishness.

Americans Want Acceleration

It is a certain fact that the American public demands the appearance of great size in its cars. The largest car selling for a given price will carry large sales, simply due to its size. Coupled with this demand for great size, the American public also demands acceleration. Size means weight and weight certainly operates against the quality of acceleration to such an extent that the torque requirements of the engine must be increased greatly to give the pick-up desired with the large car.

In Europe there are cars which, by a scientific use of the wheelbase, give all the necessary room at a greatly reduced weight, and consequently can supply all the acceleration demand with an engine of greatly decreased developed horsepower. The fact that the car weight is less allows the engine bearings and all other parts to be reduced accordingly and at the same time have factors of safety which are largely those used in average American practice, giving a greater endurance and a smaller service factor than can be expected from the large, heavy, high-powered design which engineers have been forced into much against their will.

Time for Economy and Efficiency

As mentioned at the beginning of this paper, this is war time. It is a time for economy and efficiency; therefore, let us appeal for a car design which is efficient and economical. It is exactly what the public wants, but owing to the education which we have given them through unhappily worded advertisements and by other means, the public believes that

*Presented before the Cleveland Section, S. A. E.

its demands are met in proportion with the size of the car. Tire economy and miles per gallon of gasoline and other desirable requirements have been sacrificed because it is believed that acceleration and comfort in riding can only be secured with the car of long wheelbase. As a matter of fact, careful design, coupled with compactness in engine units, will allow several inches to be taken from the wheelbase of the car without any sacrifice of room, without a great loss in riding comfort, if any loss exists at all, and at the same time with a gain in materials, a saving in weight, a saving in tires, a saving in gasoline, a saving in space required for parking, and a saving in every direction which can be thought of. It costs less to build a shorter car, and this money could either be taken from the price of the car, which would certainly be another factor in what the user is demanding, or it could be put in refining the design, with the result that probably even greater lightness would result and better upholstery, better painting, and better trimming could be applied which would tend to make the result a high-class car throughout.

Trend Toward Smaller Cars

For some reason or other, high priced cars in this country have nearly always been big cars, due to the necessity for catering to the taste for size, and yet the very trend of public demand shows that exactly what it wants can be met in a medium priced small size car which incorporates all the beauty of design to be found in the highest priced products, and all the excellent materials which are used in cars which to-day are only sold in long wheelbase.

Engine size has nothing to do with performance. Torque-weight ratio is the governing factor in acceleration and hill climbing, the two greatest demands made by car buyers in this country. The demand for reserve torque will probably exist for years to come, and the value of horsepower is something which has been greatly exaggerated by means of the literature of engine and car manufacturers. The words "high power" are fascinating to the layman's mind, and he has been led to believe that if he has a powerplant capable of a high maximum output under his hood, he has an engine which will enable him to run away from other cars with a powerplant not capable of developing such high output. This, of course, in the face of real analysis is untrue, because the high horsepower may not be reached until such a high number of revolutions per minute that the car speed would be prohibitive under ordinary gear ratio conditions.

All the performance desired in a five-passenger car can be secured with an engine under 200 cu. in. piston displacement. All the acceleration wanted and all the hill-climbing ability would be incorporated in such a car. The ration of engine torque to weight could be made very high in such a car at the speed at which such a ratio is most desired, and if an engineer were told to get out a five-passenger car in which all the performance demanded is incorporated, together with an economic use of materials and an economic maintenance factor maintained, he would be wrong to go much above the 200 cu. in. limit. The idea that a perfect-riding car is one of infinite weight should not be the goal.

Pounds Per Passenger Too High

Weight of car per pound of passenger weight is too high in America. The tendency toward long wheelbase and big engines is responsible. A five-passenger car should not weigh more than 3 lb. per pound of passenger weight if it is to be considered a truly economical design. With a designed load of 750 lb., a 2250-lb. car would be about right.

If this economy in material and maintenance were carried out there would be much less talk regarding material shortages, and this vital means of transportation would not be threatened to be put in the class of non-essential industries. It is impossible to picture the farming districts of America without automobiles. It would set the country back like nothing else in the realm of imagination.

This presents the picture from one side. We all know what the public demands because we know exactly what we like ourselves in a car. We like to step into a roomy, comfortable front compartment, into which we do not have to squeeze in order to seat ourselves behind the steering wheel. We are always pleased when our first glance tells us that the control members can be readily seen and readily reached. We want the engine to start almost on the first touch of the starting button; we like the starting pedal to engage with little effort, with the engine running smoothing and quietly; we want a clutch pedal which is depressed by very light touch of the foot and which when engaging gives a smooth pick-up without unnecessary slipping and without excessive grabbing. In shifting gears the clutch should release instantaneously and positively, so that there is no drag in the gears, and the gear lever itself should throw into mesh with a minimum movement and with a minimum amount of reach required to place the hand upon the shifter cane. In picking up, the operator should be able to depress the throttle almost as quickly as possible without creating undesirable conditions of knocking, choking, spitting back, or laboring of the engine. In other words, carburetion, gear reduction and engine capacity and torque output should be so attuned that a smooth accelerative ability is given. Here, of course, lightness again enters.

The Cold-Starting Problem

Winter is now upon us, and to the list of requirements given above must be added that of starting rapidly on a cold morning. This is the most pertinent point of all at the present time.

All the hot spot intakes and exhaust jacketed carbureters in the world will not do one thing toward making the car easier to start. The carbureter manufacturers have provided us with very efficient chokes; even at the speed attained by the average starting motor on a cold morning these chokes are capable of shooting into the cylinders a supply of raw gasoline which would go a long ways in operating a dry cleaning establishment. Sometimes some of this raw liquid is ignited during the first three or four minutes of cranking, but quite often the motorist helps the situation along by distributing ½ pint more of gasoline between the four, six, eight or twelve cylinders. This joins the supply which the efficient choke has put into the combustion space, and ignition starts only, however, after a liberal supply of the raw fuel has leaked its way past the piston rings and gone down into the crankcase to help form what is sometimes called "crankcase soup."

Oil Dilution Serious Matter

If the car starts in 30 seconds the user is fairly well satisfied. He does not think, however, of all the gasoline that can be drawn into the cylinders and leak past the piston rings in the space of 30 seconds, he does not consider the fact that his lubricating film has been destroyed to a large extent by this gasoline, and he does not stop to consider how much the supply of lubricant in the crankcase has been deteriorated due to dilution of the oil by the heavier constituents of the gasoline.

This situation is probably the most serious one which confronts the designer to-day. The automobile user is demanding service, and he will not get good service from an engine which is being treated in this manner. The first few minutes of running with an engine in this condition are working considerable damage to that powerplant, and the problem must be met quickly or else a great amount of damage is going to be done during this winter to cars which are kept in unheated garages. The unheated garage is by far in the majority, it must also be remembered.

In these days when high prices of labor and material are forcing the price of cars upward, something must be done to meet the cold starting situation. A heating coil in the float chamber, or some other gasoline chamber, a water heating system connected with the radiator, or some other method which is equally effective, must protect the owner from the consequences of crankcase dilution. The average owner is wise enough to know that it is requiring a pint or more of gasoline for him to get his engine warmed up on a cold morning. He knows that he is not burning this pint of gasoline and all of it is not going out of the exhaust; therefore, the remainder forces its way into the crankcase, and cars

which are fitted to combat this trouble are going to have a strong selling argument and are going to go a long ways toward meeting one of the biggest demands made by car users on the car manufacturer.

Preheating the Air

The heated intake has been studied so carefully by all manufacturers that it is useless to dwell upon it. Only one suggestion should be made, and that is that there are a great many manifolds which are erring on the side of too much heat rather than too little. It is practically impossible to meet the extreme ranges of temperature conditions, which range amounts to 100 degrees, or more in most of the cities along our temperate belt without some sort of adjustment. The air is always preheated to some extent and probably the means of adjustment to meet the outside temperature conditions is most rapidly effected by varying the amount of heat which is imparted to the initial air before it enters the carbureter. Too much heat makes the engine unsatisfactory, due of course to its reduction in volumetric efficiency, but the proper amount of heat, in spite of the expansion of the intake gases, will often result in an improved torque curve.

Economy Demanded

There is no Herbert Hoover controlling the gasoline situation in this country, but it might be due to his influence that the habits of economy are being instilled into the minds of the Americans more than ever before. It is a noticeable fact that this year's car users are demanding gasoline economy more than ever, and vigorous activitities can be noted on the part of carbureter manufacturers to supply this demand.

The carbureter, however, is not the only factor in economy. Lightness, which has always been important from a performance standpoint as well as that of economy, is a paramount necessity. Lightness does not only mean the reduction of weight by scientific design of parts, but it is possible to gain a far greater amount of weight by a scientific use of wheelbase length. In this country we have been wasteful of wheelbase. We have secured a minimum of passenger space with a maximum length of car. It has been possible in Europe, due to the use of shorter engines, shorter hoods and the more scientific location of parts, to get much more room on a given length of car, with the result that the car weight per passenger has been very much reduced. Scientific designing from one end to the other would make possible a great economy in materials and yet a very little sacrifice in performance; in fact, there need be no sacrifice but an actual gain in the way the car operates.

Silence and Appearance

The rear axle gears and in fact the entire transmission mechanism should be quiet and sturdy, the propeller shaft should not whip, and none of the parts beneath the chassis should be so filled with grease cups that the user of the car is fortunate, indeed, if he finds 25 per cent of them on his first greasy search beneath the chassis.

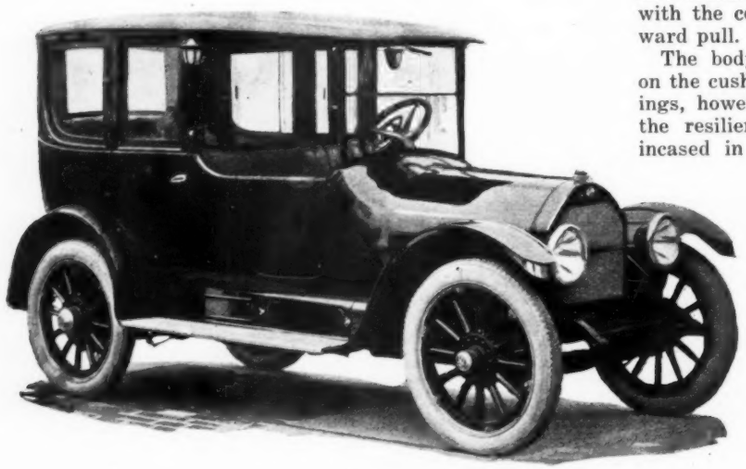
The appearance of the car should please the eye. Exterior appearance is a matter of choice, and like a great many things which are changed from season to season, it is impossible to lay down any rule as to what they should be like. Present-day style calls for long, straight lines without sharp breaks from radiator cap to the end of the tonneau. Another year this might be different. Nevertheless, the car should conform to the dictates of the moment. The upholstery should be good, and here it may be said that some of the latest of imitation leathers are rendering excellent service and are doing better in fact than poorer grades of genuine leather.

Buying Public the Arbiter

The top should be so designed that it is quickly put in place, and the side curtains should permit of ready view on all sides of the car. Some of the side curtains, with their small lights, shutting off the view of the driver, are a positive menace in city driving rather than an advantage. The windshield should be drip-proof and have the ventilating feature which has come to be demanded by everyone. The public is demanding a good car and an economical car, and the engineer must supply by scientific design what the public demands in the face of the fact that he is now under limitations of material which did not hinder him a year ago. The public demands are the ultimate factor in the sales of the car, and the closer that engineering design dovetails with the demands of the public and at the same time coincides with what is really scientific and efficient from an engineering standpoint, the better the ultimate car will be.

Willys Produces Knight-Engined Taxicabs

THE Willys-Overland, Inc., Toledo, has recently concentrated on the manufacture of a Willys-Knight chassis equipped with a special taxicab body. This car is being used to some extent in both New York and Chicago. The rear seat will comfortably carry three passengers, and two others may be seated on the folding auxiliary seats. The latter are deeply upholstered and attached to the partition between the front and rear compartments by means of sliding bars and channels. When not in use these seats fold back flush with the compartment and may be released by a slight upward pull.



Willys-Knight taxicab

The body is upholstered in Spanish leather, hand-buffed on the cushions, backs and sides. The panels, doors, and ceilings, however, are machine-buffed, and all cushions are of the resilient spring type, comprising many small springs incased in a canvas container. The additional equipment of the rear compartment comprises silk roller shades and a soft thick carpet, as is in line with the practice on high-priced private cars. A speaking tube, black enamel card case, aluminum pins for holding taxicab literature, and a compartment ventilator complete the equipment.

The standard finish of the taxicab body is rich dark blue, the wheels being painted to match, though, if desired, other colors are furnished. The fenders and trimmings are in black enamel, and the fittings are nickel and polished aluminum.

A feature of the cab is its roominess, which will make a special appeal to travelers carrying grips, etc., with them.

First Class AA ¾-Ton Military Trucks Practically Ready

To Be Purchased in Great Numbers and Used in Many Departments, Including the Post Office

THE first four experimental models of the Class AA ¾-ton trucks are practically complete. Designed under the supervision of the Quartermaster's Corps, they are destined to play perhaps the greatest part in all the work of our standardized war vehicles for the reason that they will be purchased in great numbers, and will probably be used not only by the Q. M. Corps but also for the Navy Department, Marine, Signal and Medical Corps, and also for the Post Office Department.

All these departments were considered in the design of the vehicle, which in so far as possible include provisions for the particular class of work which must be performed by each of the departments.

Although the Quartermaster Corps will use a large number of the trucks as soon as they have passed through the preliminary road test, it is expected that the Medical Corps will require at least 3500 for immediate service as ambulances. It is likely several thousand will be purchased during this year and put into service over the 4000 miles of new parcel-post routes just laid out from Maine to Louisiana by the Post Office Department.

The fact that the chassis will serve as an ambulance perhaps affected its design to a greater extent than any other consideration. It was because of the fact that they will be used as ambulances that the vehicle was provided with a torque arm and radius rods notwithstanding the fact that the heavier Class A and Class B trucks both employ Hotchkiss final drive in which the torque and propulsion are taken through the rear springs.

Easy Riding a Prime Requisite

For ambulance work easy riding qualities are one of the prime requisites, and it was considered advisable in this service to make the springs carry only the body and the live load instead of both the driving and propulsive strains. The use of the radius rods and torque arm make for a slightly heavier and more costly construction, but when the lives of our men are in the balance these two elements are secondary in consideration. These details have not been finally settled.

As previously told, the trucks were assembled by the Reo Motor Car Co., Lansing; Federal Motor Truck Co., Detroit; Maxwell Motor Co., Detroit; and the Willys-Overland Co., Toledo. The fifth truck, which will be assembled later in Washington, as a check against the design, has not yet been started.

The progress of the work at the four plants was about the same. The vehicles were originally scheduled to be completed on Jan. 15, but this was not possible on account of various unavoidable delays.

The Federal and Reo companies received their orders from the Government to begin the construction of their trucks Dec. 19, 1917, while the Willys-Overland Co. received its order on Dec. 24. The Maxwell company was the last to get its word to go ahead, receiving its order on Jan. 7.

The Federal company received the engine, springs, frame and clutch on Jan. 2, and immediately began to assemble the various component parts. With the exception of the front and rear axles its job was virtually completed on Jan. 8. The Reo company went to work on much the same schedule and completed its truck as far as possible, at the same time.

The Willys-Overland company received its engine from the Northway Motor Corp. on Jan. 3, together with the frame parts from the Reo company and the clutch assembly from the Detroit Gear & Machine Co. The steering assembly arrived on the day following and the Willard storage battery and muffler on Jan. 8. The wood wheels, transmission and radiator, the latter from the Federal Motor Truck Co., were received on Jan. 10. The starting motor, fenders, hood, tool box and universal joints arrived on Jan. 11, and the dash, instrument board and fittings on Jan. 15. Actual assembly was begun on Jan. 16, and was finished as far as possible on Jan. 24, with the exception of the front and rear axles.

The Maxwell company started the assembly of its job on Jan. 11, the date on which the frame arrived, and finished the vehicle on Jan. 24, with the exception of both sets of axles. The delay in the delivery of the axles was because they required much new die work.

All of the principal component parts entering into the construction of the vehicle were ordered from the parts makers by the Government, which was therefore responsible for the arrival of the parts at the assembly plants at the scheduled time. All of the parts, with the exception of the front and rear axle, arrived in time to complete the job on schedule.

The mechanical features of the truck have already been explained in detail in these columns. It will be noticed that the engine is provided with detachable cylinder heads and with the dual-ignition system consisting of both a magneto and generator as followed on both the previous Class A and Class B trucks. It differs from both of the latter in that it is equipped with an electric starter. It has, however, many of the characteristics of the Class A and B engines, including the hot-spot manifold and a similar mounting of the distributor, water pump and magneto on the left side of the engine looking toward the front and the governor and generator on the right side.

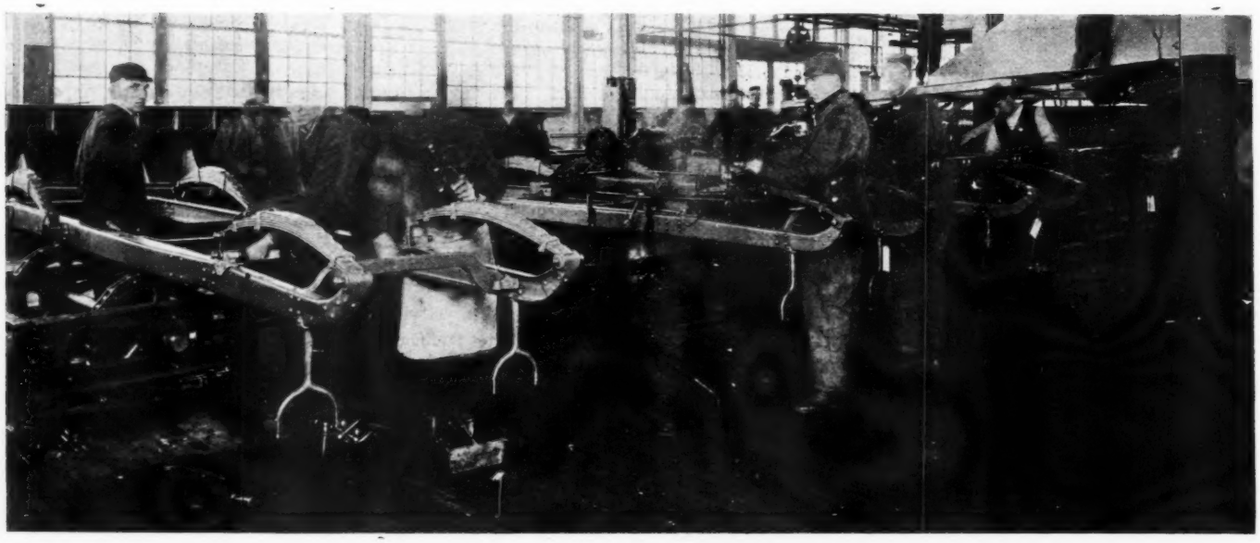
Another unusual feature of the engine is that the crankcase is so designed that cylinders of 3¾-in. bore by 5-in. stroke are interchangeable with the 4-by-5-in. cylinders now fitted. The purpose of this construction

(*Continued on page* 345)

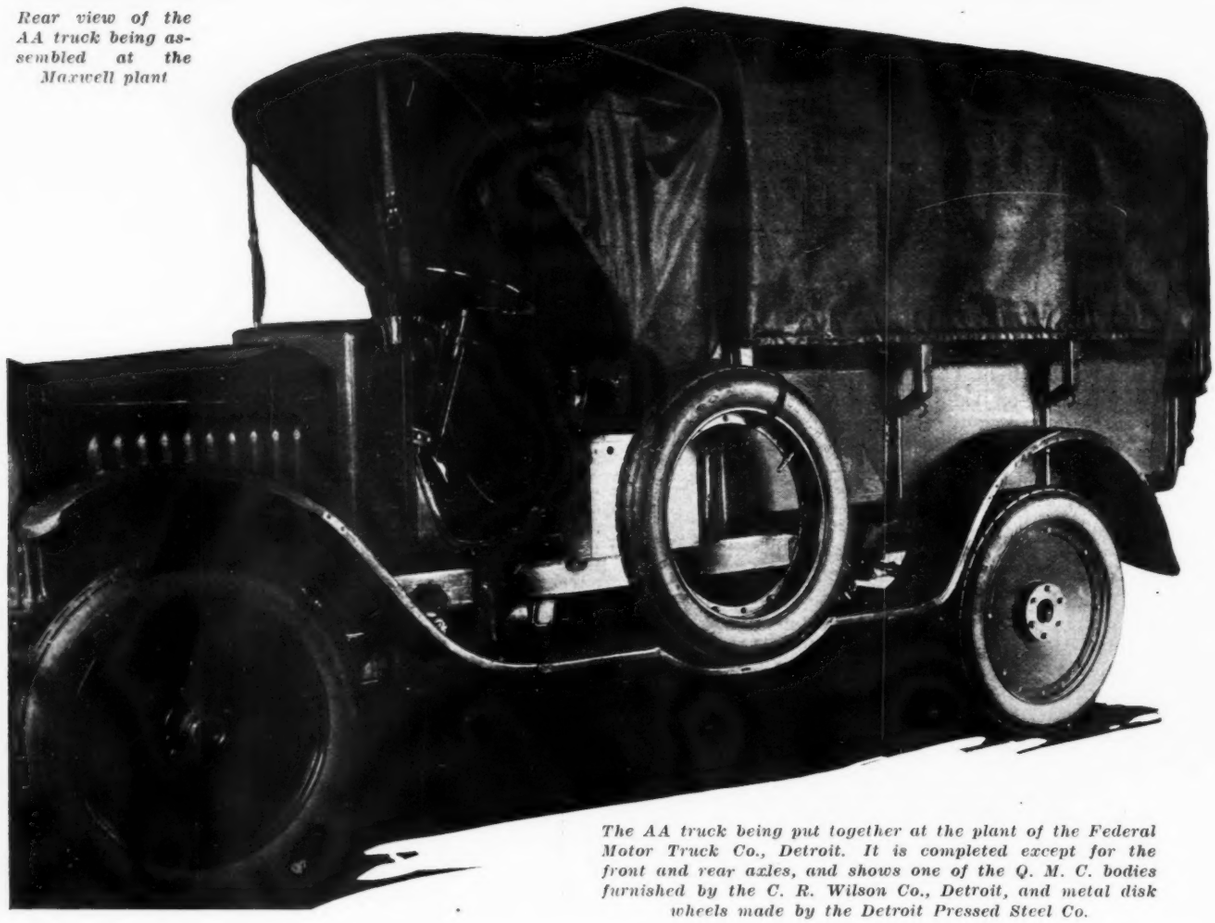
A number of photographs of these trucks assembled at the various plants handling the work appear on following pages.

Details of Construction of the Class A A Military Trucks

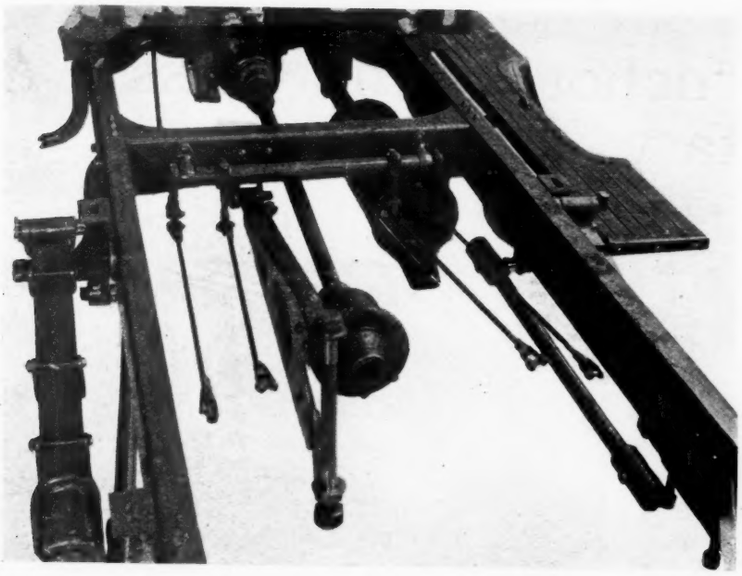
(More photographs appear on pages 320 and 321)



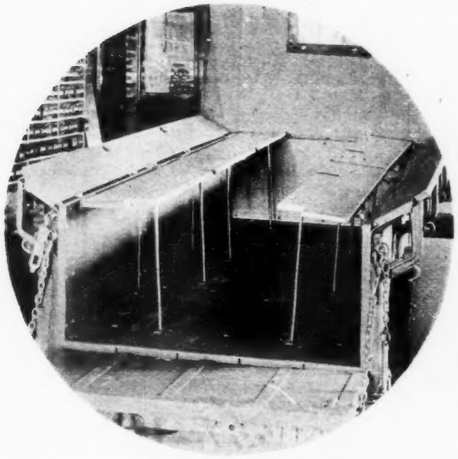
Rear view of the AA truck being assembled at the Maxwell plant

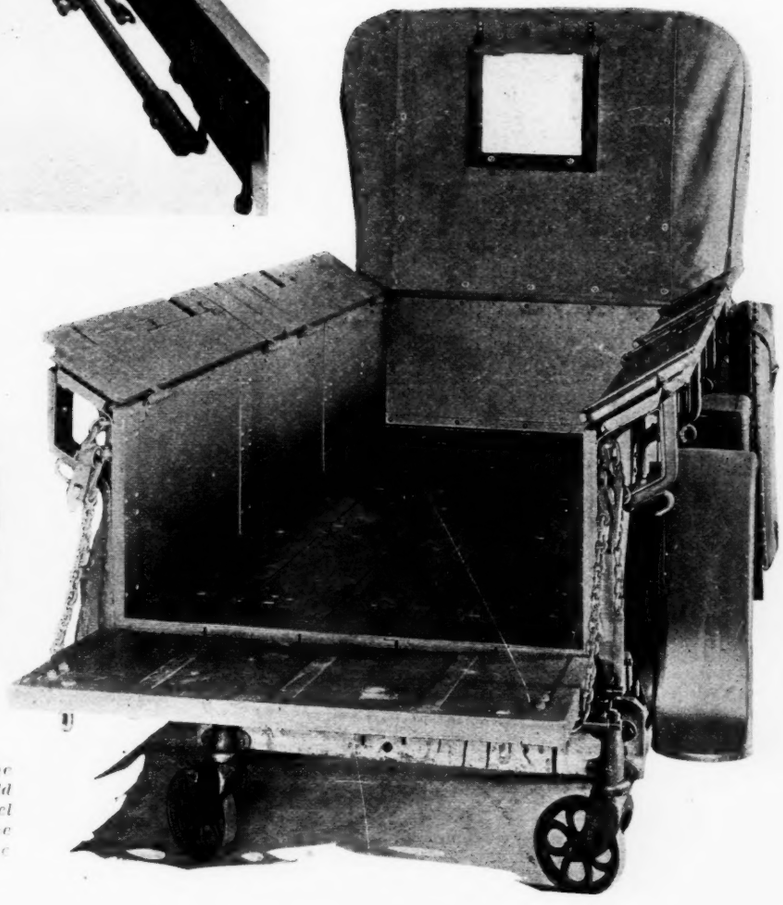


The AA truck being put together at the plant of the Federal Motor Truck Co., Detroit. It is completed except for the front and rear axles, and shows one of the Q. M. C. bodies furnished by the C. R. Wilson Co., Detroit, and metal disk wheels made by the Detroit Pressed Steel Co.

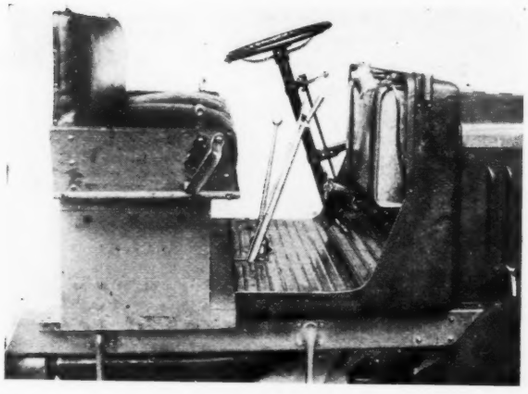


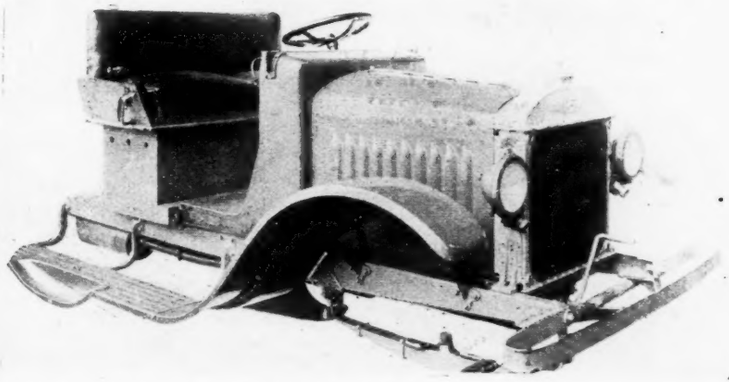
A three-quarter plan view as seen from the rear and showing the two metal universal joints on the driveshaft; the frame construction with the corner braces to take the strains of the towing hook, which will be inserted through the hole in the rear cross member and mounted on a coil spring





Rear view of the Q. M. C. body mounted on the Reo job and showing the hinged seats which fold back on the flareboards. Note also the pressed steel braces on the body sides and the hooks for the tarpaulin top. These are placed high on the pressed steel braces for convenience

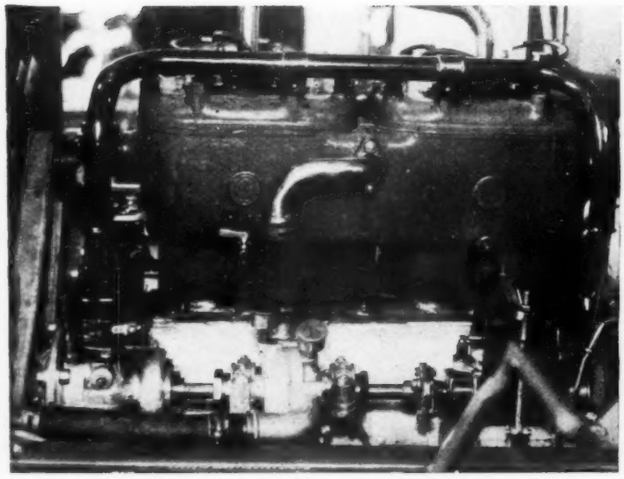




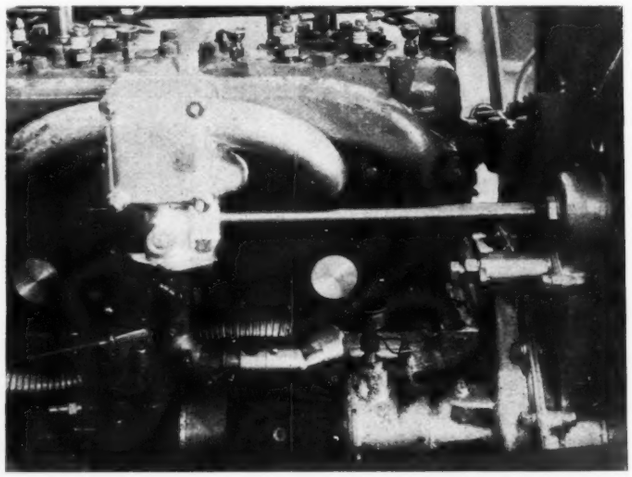
Two views of the Class AA chassis completed at the Maxwell plant, showing the well-upholstered seat, the arrangement of the control units and the substantial bumper with which the trucks are fitted

Details of Construction of the Class AA Military Trucks

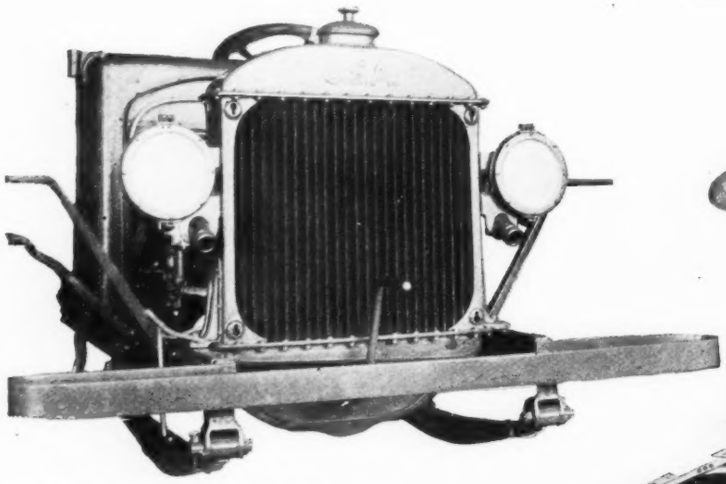
(*Continued from pages* 318 *and* 319)



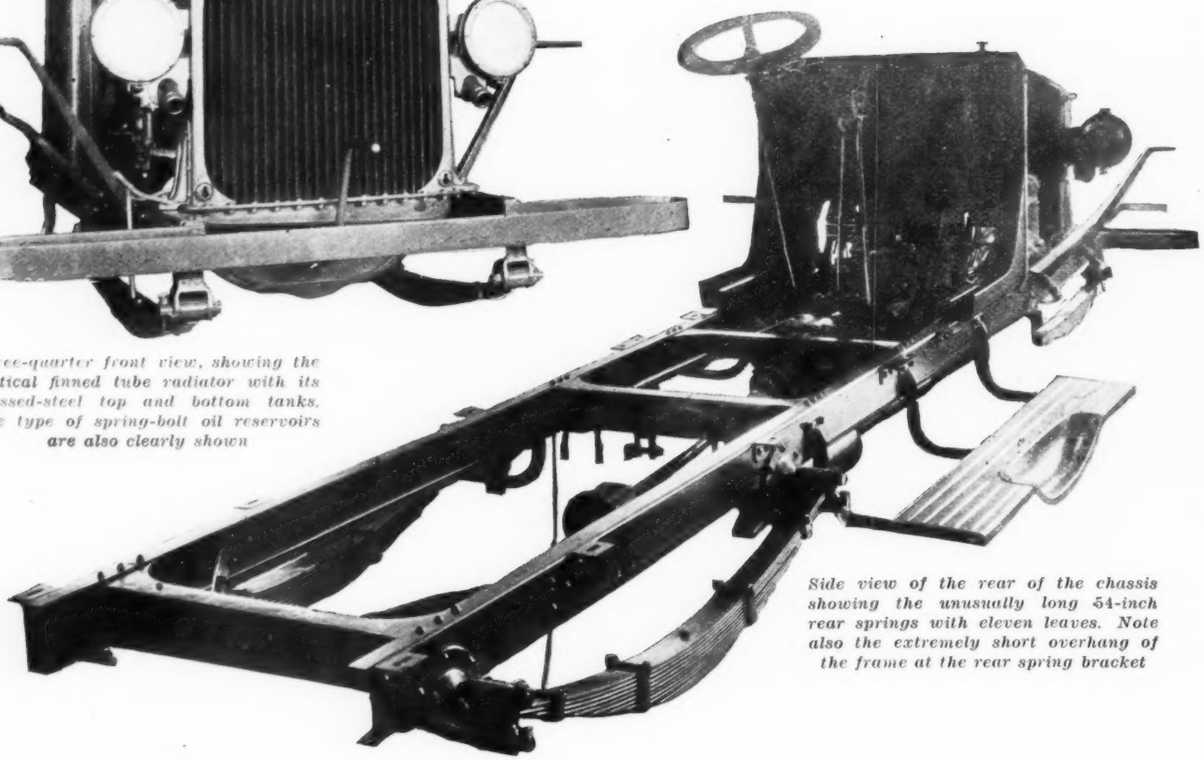
Right side of the engine showing the Remy distributor, the water pump and the Bosch magneto on the same longitudinal shaft. Note the two sets of spark plugs and the detachable heads on the cylinders



The left side of the engine showing the hot-spot manifold, the Stromberg carbureter and the hot-air pipe leading from the exhaust pipe under the fuel tank on the dash. The starter is shown to the extreme left, the Westinghouse generator in the center and the governor at the left

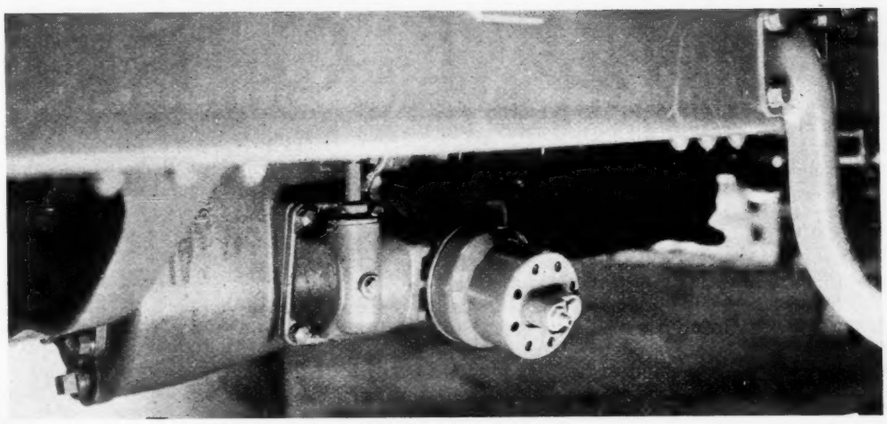


Three-quarter front view, showing the vertical finned tube radiator with its pressed-steel top and bottom tanks. The type of spring-bolt oil reservoirs are also clearly shown

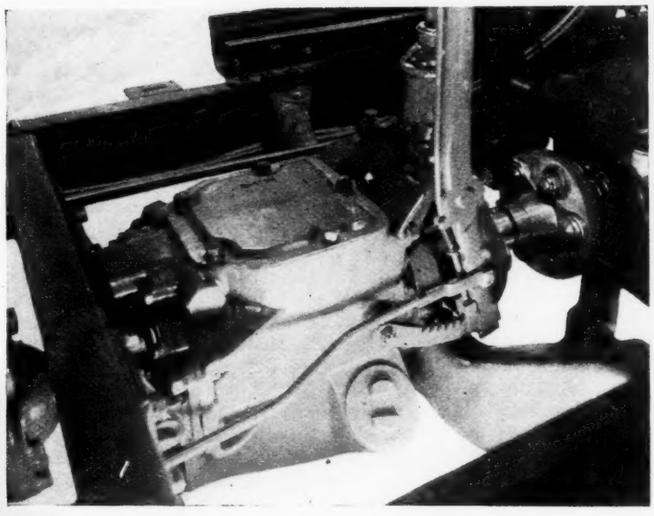


Side view of the rear of the chassis showing the unusually long 54-inch rear springs with eleven leaves. Note also the extremely short overhang of the frame at the rear spring bracket

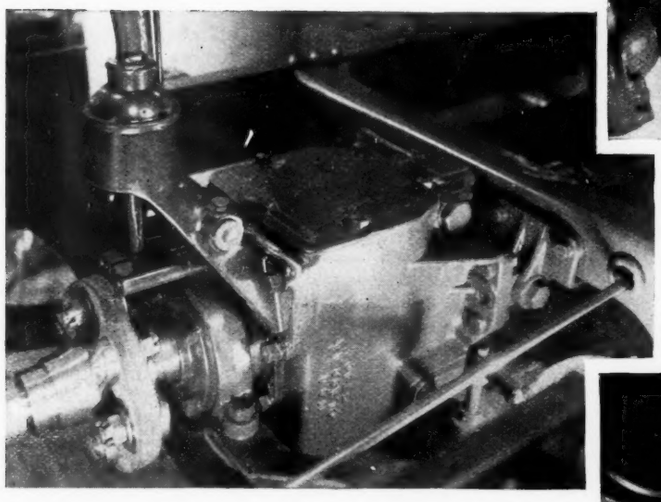
The gearset from the left side of the truck looking toward the front and showing the Stewart tire pump fitted so that deflated tires can be pumped up on the road immediately after being repaired if punctured. This is very important when the vehicle happens to be operating far from its base or a repair station



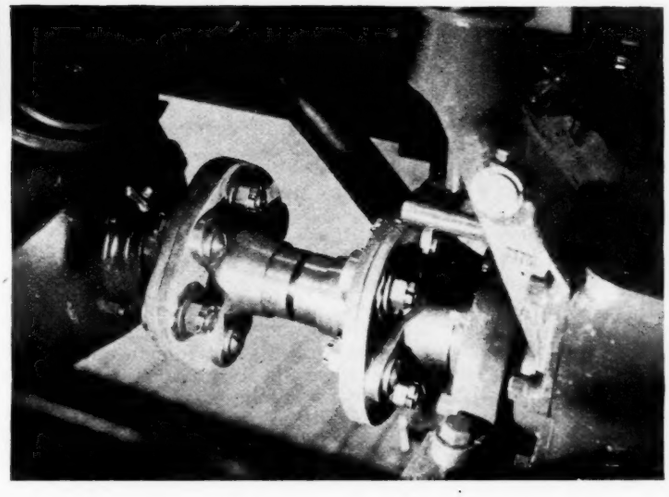
Rear view of the combination headlight and shaving-stick night driving light as mounted on the side of the pressed steel radiator casing of the Overland job. Note the manner in which the wires for the headlight and the small spotlight are carried in the same metal conduit



Right side of the gearset housing, showing the large filler plug and the method of mounting the brake lever on a special bracket on the cover so that it can be removed easily if the gearbox needs to be removed



The unusual three-point support of the gearset with the trunnion type bearing on the front and the two semi-universal-like supports at the rear



Plan view of the method of taking the drive from the clutch to the gearset by means of two Thermoid fabric universal joints. Note the amidship positioning of the gearset which makes it easy to remove it without disturbing the clutch

The FORUM

Standardizing Balance

By N. W. Akimoff

A NEW sort of technical standard is being proposed by the author, that of balance, both static and dynamic. It will take several years to put through an idea of this sort, but by constantly pounding at people's common sense it is felt that this can eventually be done.

In five or six years a prospective purchaser will begin to demand that certified proof is produced to the effect that the initial unbalance in the car he wants to buy is *not over so much*, in pretty much the same way as he now buys sugar by the pound and gasoline by the gallon, instead of by the handful or bucketful, respectively.

Incidentally, no one ever bought a pound of sugar or a gallon of gas; the very conception of an exact pound or gallon would lead to complications that would discourage the buyer and would cost him much more than the goods themselves.

All the buyer knows, all he cares to know, is that the weight of a given quantity of sugar is approximately the same as the weight of an adopted standard, determined on a rational device that is not supposed to be out TOO MUCH; in other words, that the possible error is surely not more than so-and-so.

Now, since balance can actually be weighed, not necessarily in pounds but nevertheless in definite, rational units, why not insist on certain tolerances, outside of which we have unbalance, and inside of which balance is good, or at any rate practically acceptable?

For static balance the unit is *ounce-inches*, and the limit proposed by the author for a body not exceeding 150 lb. in weight and whose journals are not over 3 in. in diameter should be 0.4 oz.-in.

For dynamic balance, which really is due to the absence, or in general to the action, of a centrifugal couple, the logical unit is not the measure of a couple, say in foot-pounds or in ounce-inches, but a new unit, proposed by the author some time ago, *inch-ounce-inches*, or *ounce-inches square*. The advantage of this unit is that it brings out the very essence of the centrifugal couple, *minus the speed element*, which for our purpose is absolutely immaterial.

Now, for a body of the character outlined above the allowable dynamic unbalance is, according to the author's suggestion, not to exceed 12 oz.-in. sq.

The author has established these limits from numerous observations in his laboratory and feels that they are practically permissible, not inconsistent with the requirements of good production, yet capable of satisfactory results in operation.

Two main classes of manufacturers will bitterly oppose the introduction of such standards, not realizing that progress cannot be choked: 1. The man who feels that there is *nothing in it*. Our fathers made money without any balance at all, and why should not we? etc. 2. The man who believes that one degree of balance is exactly as good as another; that all balancing machines are alike, and the cheapest is possibly the best after all, regardless of the principle on which it works; also his twin-brother, the man who believes that he can build a *machine of his own*, just as if this were as easy as rolling a cigarette. This latter class of engineers is highly amusing and entertaining: they get the appropriation and just go to it!

The author has seen tens of thousands of dollars' worth of such machinery of "own" make thrown into a huge scrap pile, although in a few isolated cases the designers still stick to their creations with an ardor that would make Pygmalion himself fairly sick; all this at the dear public's expense.

Now there is an easy manner in which this chaotic condition can be remedied; here is a criterion that ought to be safe, and at the same time fair to everyone:

1. All machines which comply with what follows are balancing machines; those which do not comply cannot be advertised by that name or sold for purposes of balancing (think of a scale or a set of weights or of a 5-gal. measure that would not answer similar conditions).

2. A steel rod, ground perfectly straight, of about 2 in. diameter and 3 to 4 ft. long, when placed in the balancing machine and operated at 300 to 400 r.p.m. should exhibit no vibration.

3. Static unbalance of not over 0.4 in.-oz., caused by such means as suitably fastening a small weight to the periphery of the above-mentioned rod, should be clearly indicated by the machine at speeds not exceeding 300 r.p.m.

4. Dynamic unbalance of not over 12 oz.-in. sq., caused by such means as fastening two small weights to the periphery of the rod, at opposite sides and at proper longitudinal distance from each other, should clearly register on the machine at speeds not exceeding 300 r.p.m.

5. In actual balancing the amplitude of oscillations of the indicator will not exceed that secured under tests 3 and 4 respectively.

Under this plan no real balancing machine can be excluded from the field and no fake appliance can receive much encouragement; of course, people will get up new balancing machines right along, since it is not possible to restrict the art itself by patents or otherwise, but only separate, individual designs. But any such machines must clearly show that they can do the work.

Let the manufacturer prepare himself to the new situation, demand for standardized balance.

Overhanging Propeller Shafts

By H. R. Trotter*

THE writer's attention has been called to Mr. C. J. Schipplock's criticisms of the Howard Aero Engine in your issue of Dec. 6.

The use of an overhung pinion construction is not prohibitive, provided due care is taken in the design and selection of materials used.

It can be taken for granted that all shafts deflect and that deflection takes place even though the shaft be unloaded. This deflection also is accentuated with an increase in speed and cannot be prevented by the use of a so-called rigid type of ball bearing. The employment of this type of bearing simply results in the overloading of a few of the balls and a rapid increase in friction loss with consequent wear.

With the employment of a self-aligning type of bearing, these disagreeable features are entirely eliminated and the bearing capacity remains the same, independent of any position which the shaft may assume. The greatest advantage, however, obtained by the use of the self-aligning bearing is that there is no danger from excessive shaft stresses. Furthermore, there is no possibility of the bearings being unduly loaded beyond their capacity by inaccurate machining, as is very often the case with the rigid type of ball bearing.

When plain sleeve type bearings are used, inaccurate machine work is easily detected because of the fact that if the bearings are out of line, the shaft binds and in some cases will not rotate.

It is a well-known fact that the friction loss of a ball bearing remains practically constant, despite the increase of load. It is, therefore, possible to bind a rigid type of ball bearing and thus heavily overload the balls without any evidence of this overload being apparent.

A shaft running under this condition is also subjected to very severe reversal of stresses. These stresses constitute a danger which is always present if a self-aligning bearing is not used.

*Of the S K F Ball Bearing Co.

Chassis Design of the Class B Truck*

A Chronology of Events Leading Up to the Work—Changes from Original Specifications—Reasons Behind Pressed Steel Frame and Hotchkiss Drive—Engine and Gear Box Mounting and Chassis Lubrication

By Cornelius T. Myers

IF there is an accomplishment any more representative of the spirit and constant endeavor of the S. A. E. than the design and building of the first class B Military Motor Truck it does not appear on our horizon at this moment. It represents one culmination of the ideals for which the Society has labored unceasingly, and that it is to be of service to our country at this time is a reward that few of us expected.

In touching on the chassis design the writer will put down just a little of the chronology of events leading up to the starting of the work, and will then touch upon a few fundamentals, following with notes as to details.

Chronology of the Truck's Design

On June 27th, 1917 (the day after the close of the semi-annual meeting of the S. A. E. at Washington), a large number of engineers representing truck builders and component parts makers met in Washington to discuss with Captain Britton, of the Quartermaster General's office, a military motor truck composed of standardized parts. These men divided up into groups, representing engines, axles, transmissions, chassis, etc., and after some discussion it was decided that the job could be done. A tentative layout for the Class A chassis was discussed. A layout for the Class A truck using the parts suggested by the parts makers groups was made and submitted at the next meeting, which was held July 9 and 10 in Columbus. The layout was discussed and a few changes recommended, which were incorporated and submitted July 20 and 21 for the second Columbus meeting. A layout of the Class B chassis was made and quite fully discussed. The Quartermaster General's office then took over the work, having decided that a truck standardized in all its parts should be designed. A number of the engineers who had been working on the chassis and parts designs were asked to go to Washington and complete the design under the supervision of the Quartermaster General's office. On July 30 these engineers reported in Washington ready to continue the work.

On August 27 the Schedule Committee on Design was organized and divided the work among parts groups, setting September 10 as the day on which the design should be completed. Between July 30 and August 27 much preliminary work was done by the parts-builders groups but no progress could be made with the chassis design, as there were differences of opinion among the members of almost every group of parts designers.

The parts designs were finished on September 10 and within a few days the chassis designs were so far toward completion that arrangements were made to produce two sample trucks. These were completed in an unbelievably short time, and their satisfactory performance began when the paint on the chassis was hardly dry. Driven from Rochester, N. Y., and Lima, Ohio, they arrived in Washington on October 14 and were presented to Gen. Chauncy B. Baker and by him to Secretary of War Newton D. Baker on October 19, which will always be held a red-letter day in the annals of the Society.

The chassis design was based upon the Quartermaster General's office specifications of May, 1917, which were closely followed. The principal changes were as follows:

	May Spec.	Actually
Wheel-base limit,	156 in.	160½ in.
Weight limit,	8000 lb.	8800 lb. (aprx.)
Rear tires, diameter,	36 in.	40 in.
Type of tires,	demountable	pressed-on
Radiator surface,	305-sq. in. frontal 322-sq. in. total	
Tractive factor (high),	0.0775	0.063
Tractive factor (low),	0.338	0.307
Ignition system,	dual	double
Differential,	locking	free acting
Chassis lubrication,	grease or oil cups	mag. oil feed
Gasoline tank,	30-gal. tank 6-gal. reserve	2 16-gal. tanks
Sprags,		added
Pennant stops for springs,		omitted

The following were the guiding factors in designing the Class B chassis; they are set down in the order in which they were given weight. (This tabulation was not official but was observed by the writer, acting as chief draftsman on this work, and it was generally followed):

(1) Reliability.
(2) Accessibility.
(3) Weight.
(4) Simplicity and ease of manufacture.
(5) Operating economy.
(6) First cost.

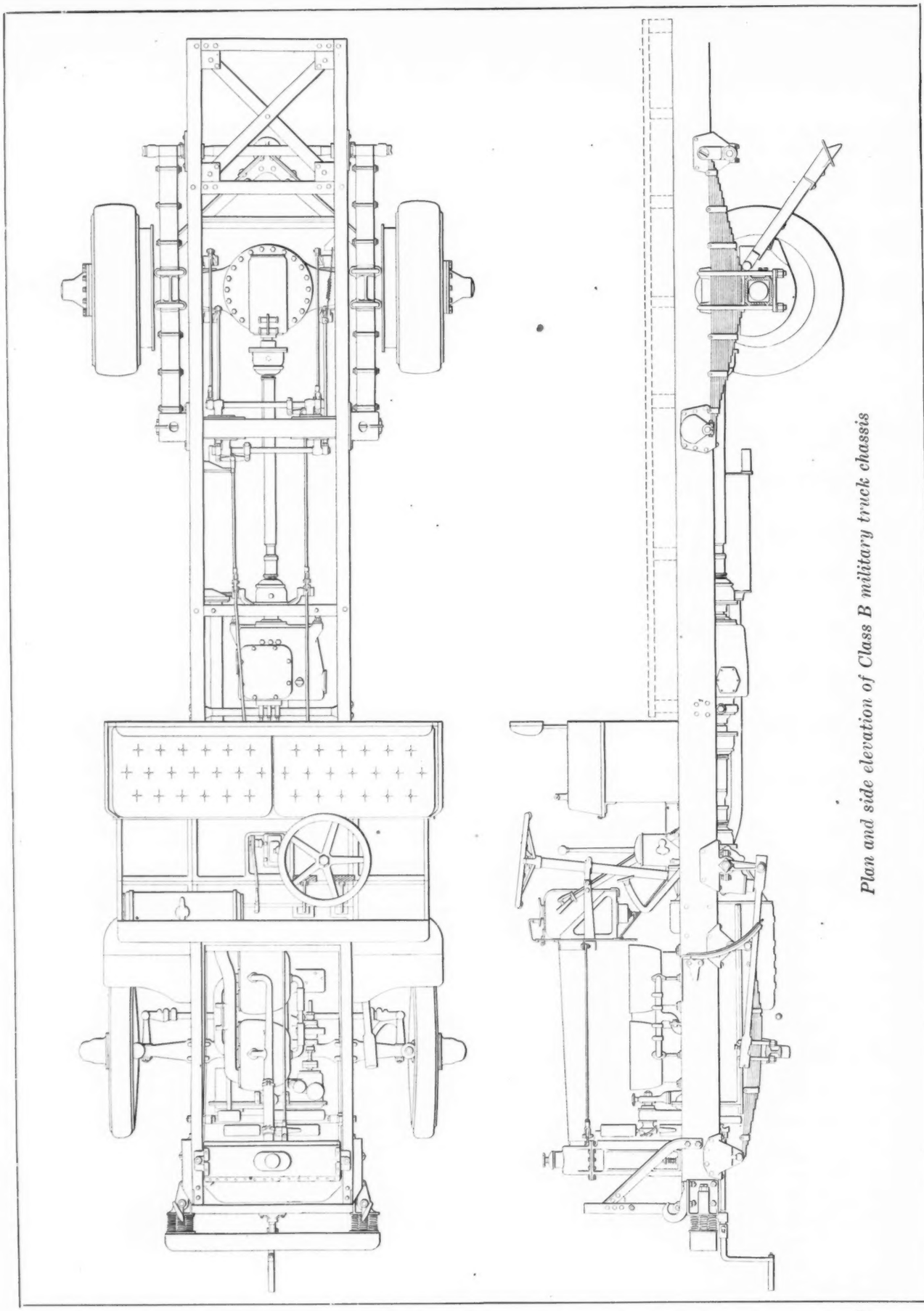
The item of efficiency was more particularly studied and cared for by the parts design groups. Wherever the location or suspension of a part had an important bearing on efficiency it was considered as having greater importance than the second item.

Possibly as good a way as any to describe the chassis design is to take up the units which enter into its construction, beginning with:

Frame Construction

The frame is of open-hearth steel pressed into shape. The side rails are channel section with parallel flanges which are tapered at the front to reduce weight and give greater room for the radiator. There is a heavy pressed steel cross-member in front of the radiator, one between the front brackets of the rear springs, and one at the rear. A lighter pressed steel cross-member supports the rear of the gear-box, while a

*Paper read at the S. A. E. Winter Meeting.



Plan and side elevation of Class B military truck chassis

forged cross-member supports the front of the gear-box and the point of the engine. The frame is designed to be as flexible as possible without in any way being flimsy or likely to buckle.

The pressed steel frame allowed better distribution of metal than a rolled section, its uniform thickness is of advantage in rivetting—there is better assurance of uniformity of metal, and the rounded portion where the flanges meet the web allow large fillets or brackets. The frame is a bit narrower than usual, 34 in. to outside edges, in order to allow a maximum turning angle for the front wheels and to save weight in cross-members and support brackets.

The springs are designed to be nearly flat under rated load. The axles are fastened to the middle of both front and rear springs. This permits the assembling of the front springs without fear of damaging the steering-gear linkage, as might take place if the front axle were not in the middle of the springs and the long end of the spring on a repair job was put where the short end should be. The spring seats are also reversible and the steering pivots are given a castor action by inclining the whole front spring. This also enabled us to get a good location for the ball on the axle steering arm and to insure a minimum of stress on the steering-gear and drag link due to axle motion.

Hotchkiss Drive Adopted

The rear springs form the driving connection between the rear axle and the frame a la Hotchkiss. The discussion at Columbus previous to the decision to adopt this type of drive was illuminating, and after all was said the only argument against it was its tendency to throw the rear-wheel brakes out of adjustment if the brake connections were not correctly designed or when the spring under load had a considerable amount of camber. To the writer's mind, however, one other point should be given careful attention with Hotchkiss drive —the slip-joint in the drive-shaft at the forward universal joint. Unless the slip-joint is carefully made, thoroughly protected from dirt and properly lubricated, the motion there will result in a serious end-thrust being developed on the universal-joint and the bearings behind it.

By placing the steering-gear behind the rear engine support-arm a long straight drag link was secured. The gear is held by a capped minion-bracket and can be readily removed without disturbing the engine or controls. One of the bolts in the gearcase extends through a lug on the bracket and thus relieves the column of any bending strains. The column is firmly braced to the dash. The steering-gear case is located so that the clutch can be removed without disturbing the gearcase. The cap for the gearcase carries a lug that supports the clutch and brake pedals and makes a very clean bit of design at this point where, on the average truck, lifting the floor boards reveals an entanglement of brackets, shafts and nuts that are impossible to adjust without a wrist like a flamingo's neck.

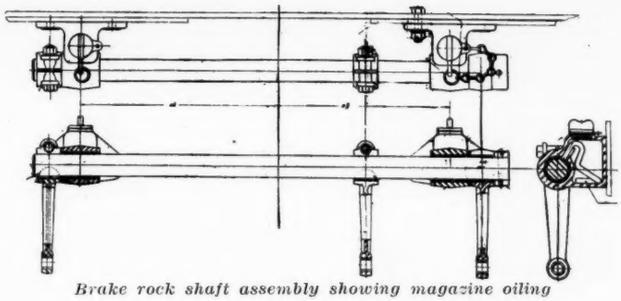
The tires specified were 36 by 5-in. single front and dual rear or 36 by 10-in. single rear. They were to be of the demountable type. After much discussion the change was made to the pressed-on type, saving some 400 lb. in weight and affirming the almost unanimous opinion of the engineers on the job and the tire makers that it was the better type. The evidence from across the water, also, was strongly in favor of the pressed-on type.

The 36-in. rear tires were changed to 40-in., which gave 2 in. more clearance under the rear axle, better adhesion, better rolling on bad ground, lower gasoline consumption, more tire mileage, and an 11 per cent increase in the truck speed for a given engine speed.

Mounting of Units

The wheelbase, named as 124-in. minimum and 156-in. maximum in the Quartermaster General's office specifications, was increased to be 160½ in. This was deemed advisable in order to keep the proportion of live load on the rear axle below 90 per cent, and at the same time have ample seat-width and a sufficient space between the seat and the steering column.

The mounting of the units in the frame was carefully considered from the following standpoints:



Brake rock shaft assembly showing magazine oiling

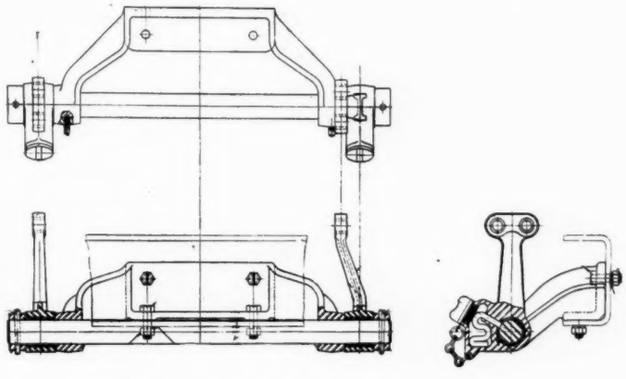
(1) Frame flexure.
(2) Accessibility.
(3) Independent assembling and demounting.
(4) Simplicity.

The radiator has two feet which rest on soft pads on each frame rail. The single holding-down bolt in each foot passes through a clearance hole in the rail and a coil spring between the foot and the nut allows the radiator to take its easiest position when the frame distorts. A rod from the flange of the top tank of the radiator is in an approximately vertical position.

The engine also has a three-point mounting. The two rear lugs on the flywheel housing rest in pressed steel pocket brackets rivetted to the frame rails. A vertical bolt passed through each lug bracket, and a heavy spiral spring between the bottom of the bracket and the nut. The bracket is so formed that the engine lug will be held in place even if the bolt is lost. It is lined, so as not to chafe the aluminum lug. The third "point" of the engine support is a cylindrical surface on the timing gear cover around the nose of the crankshaft. This swivels in a forged cross-member which is bolted to brackets on the frame rails. This construction is light, substantial and is easy to dismount when necessary. An odd feature is that the boss leading from the bottom of the radiator to the pump on the engine is jointed by a piece which is fastened to and passes through this cross-member. The clutch is housed in with the flywheel and the gearshift is mounted on the clutch housing. The hand-brake hand-lever is mounted on the side of the gearshift housing and is (to the author's mind) an objectionable feature as it subjects light aluminum castings and the stud threads in them to the heavy pull in the brake-rod. This pull can be severe when the rear springs flex violently, for the rachet on the hand-lever is non-yielding and there is bound to be some relative longitudinal motion between the rear axle and the brake rocker-shaft.

Gearbox Has Three-Point Support

The gear-box suspension is three-point. At the rear of the box two forgings bolted to it carry lugs for horizontal transverse pins which are carried by vertical clevis bolts in a pressed steel cross-member of the frame. The third "point" of suspension is in a forging around the nose on the front of the gearcase. This forging is held in brackets rivetted to the frame. The center-line of the main shaft in the gear-box is



Magazine oiling of floating brake levers

a little lower than that of the engine. This gives a slight angularity to the front propellor-shaft and also some motion to the universal-joint trunnions; it also drops the gear-box cover below the top of the frame and gives more nearly a straight-line drive from the gear-box to the rear axle.

The design of the dash in connection with the gasoline system, which was considerable of a problem, was solved by locating half the supply of gasoline in a tank on the dash and the rest in a reserve tank under the seat. When this was first suggested a hand air-pump was to be provided, as was also a pipe from the reserve tank to the top of the service tank so that the reserve supply could be readily transferred. At present, however, the transfer is accomplished by means of a bucket or can.

In the chassis lubrication of both Class A and Class B chassis, as originally laid out, it was also planned to use oil at almost every point—grease to be used only in the wheel hubs and in the universal-joints. When in Washington last week the writer learned that this was not being carried out on the Class B chassis at some points where it could readily be done. On the Class B all the spring bolts, shackle pins and brake rocker-shafts are oil-lubricated by the "magazine system." Wicks convey oil by capillary attraction from pockets of considerable size in the bracket castings to the bearing surfaces. The pockets need to be filled but once a month. Dirt is not fed to the bearing surfaces even if the oil is dirty. The oil feeds only when the truck is in motion. Seepage from the spring bolts follows down the leaves of the springs and keeps them from rusting.

The front and axle-steering pins are designed in the same way and the steering connections are designed for small wick oilers. Grease cups have been put on the drag link to lubricate the steering balls, on the starting crank, on the brake spindle of the rear axle and at other points.

Paragraph 30 of the Quartermaster General's office specifications lays particular stress on the "tractive factor" of the truck as a measure of its ability for negotiating heavy grades and bad roads. The formula for "tractive factor" is as follows:

$$T\,F = \frac{8.4\ n\ b^2 s\ R}{D\ W} \times E_m \times E_t$$

n—number of cylinders in engine.
b—cylinder bore, inches.
s—stroke of cylinder, inches.
R—gear reduction between engine and driving wheels.
D—diameter of driving wheels, inches.
W—total weight moved, pounds.

E_m—efficiency of engine compared with A. L. A. M. (now N. A. C. C.) rating as unity.

E_t—efficiency of transmission system from engine to road. Since $8.4\ n\ b^2\ s\ E_m$ represents engine torque in inch-pounds the formula can be written

$$T\,F = \frac{\text{torque} \times R \times E_t}{0.5\ D\ W}$$

It was predicted that the 4¾ by 6-in. four-cylinder engine would develop not less than 2700 in.-lb. average torque between 600 and 1000 r.p.m. The worm-gear reduction is 9.5; one-half the wheel diameter given in the specifications is 18-in.; the transmission efficiency given in the specifications is 85 per cent; the total weight moved is about 16500 lb. From these figures (on high gear)

$$T\,F_h = \frac{2700 \times 9.5 \times 0.85}{18 \times 16500} = 0.0734$$

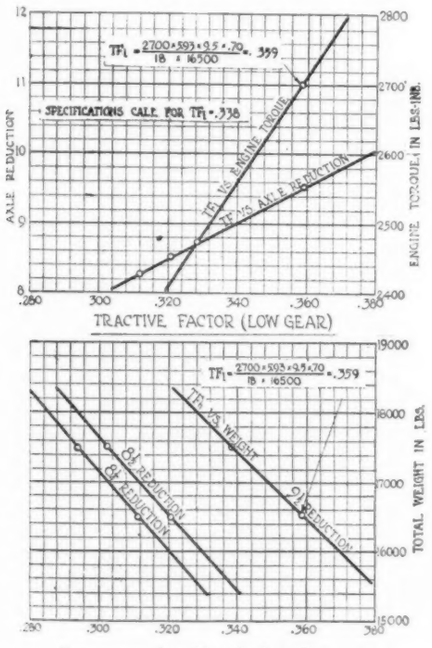
The low gear reduction in the gear-box itself is 5.93 and the specifications call for a transmission efficiency of 70 per cent. Whence (for low gear)

$$T\,F_l = \frac{2700 \times 5.93 \times 9.5 \times 0.70}{18 \times 16500} = 0.359$$

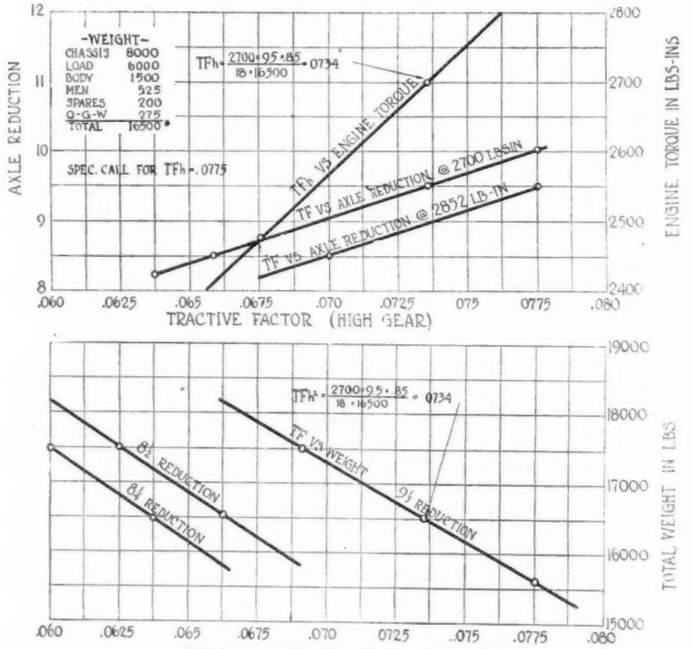
Deducting a road coefficient of 0.0175 as the rolling resistance over hard roads, these figures indicate that the loaded truck should take a 5½ per cent grade on high gear and a 34 per cent on low gear.

To get the "tractive factor" called for in the specifications (0.0775) with the reduction of 9.5 adopted, the engine would have to deliver a torque of 2852 in.-lb. On test the first engines developed in the neighborhood of 3000 in.-lb. torque. It is safe, therefore, to count on 2700 in.-lb. as a production standard.

As a commercial possibility the Class B chassis may be questioned on the score of speed, load rating and gasoline economy. Slight modifications, however, should make it the best 5-ton chassis that rolls. There are some details that are not yet fully developed for the service for which this chassis is intended, but these will undoubtedly be cared for and perfected. There is so much good design in the component parts and in the chassis itself that in many ways it will be a criterion for some time to come. To the author's mind, an English officer, after having examined the sample trucks and questioned some of our engineers regarding them, summed up the matter well when standing back and viewing one of them critically, he exclaimed, "Well, she looks a job; she looks a job."



Low gear tractive factor diagrams



High gear tractive factor diagrams

Transmissions for the U. S. Class B War Truck*

Sequence of Events in the Design of the Transmission—Frankness Marked Discussion of Features—Specifications of the Gear Designed

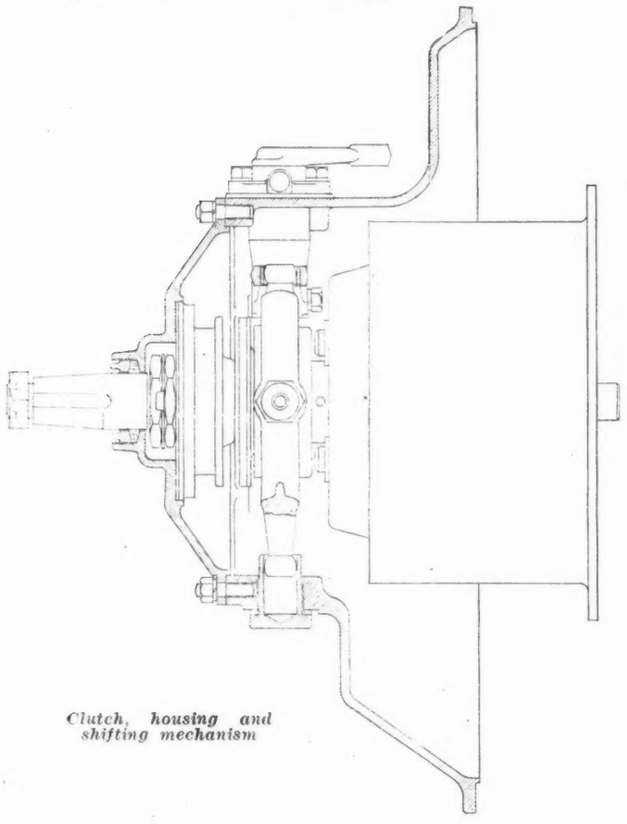
By A. W. Copland
President, Detroit Gear & Machine Company

THE first meeting of the newly formed Transmission Division of the S. A. E. Standards Committee was held May 2 and 3, 1917, in Cleveland. Some two weeks before this time the Motor Transport Board of the War Department had issued standard specifications for Class A and Class B gasoline motor trucks in the preparation of which the Truck Division of the S. A. E. Standards Committee assisted.

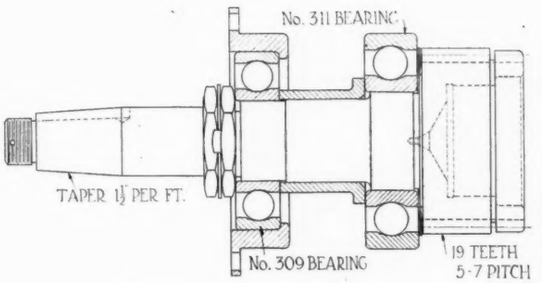
The first business taken up by the new Division was a study of the standard specifications as they directly or indirectly influenced the transmission and clutch design. Some minor changes in the specifications relating to transmissions and clutches were suggested. These were accepted by the Government and incorporated in the later edition of the specifications.

At this time the plan was to accept any commercial engine, transmission, and axle that would come within the specifications and use them in trucks that would measure up to the requirements. However, the design of the fastening points and connections for each major unit was to be standardized so that each unit would be interchangeable with any other unit of its class. The Transmission Division took up this work with great earnestness and held several meetings during May and June.

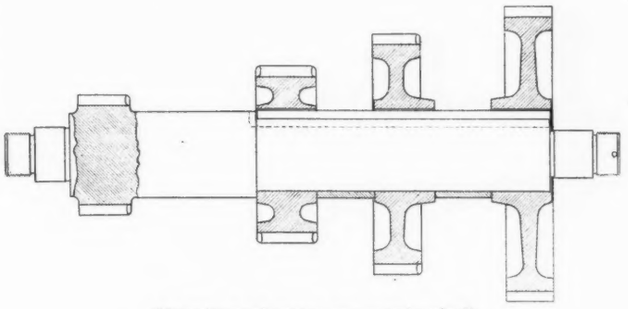
*Prepared for S. A. E. winter meeting.



Clutch, housing and shifting mechanism



Support of constant mesh pinion



Mounting of gears on countershaft

Nearly every transmission maker in the country submitted at least one design and some manufacturers presented a new design at every meeting. It was found necessary to make changes in the fastening points of every transmission then in production which was submitted for consideration; in most cases the gears and countershaft were the only parts not changed. One maker insisted on having the size of holes in the rear supporting-arms of his transmission made the standard, declaring it was the only thing on the outside of his design that had been left to him. Real constructive work was accomplished by the free discussion and friendly criticism of each other's designs.

The following incident will illustrate the practical value of these frank discussions: Mr. A. remarks: We have never had an entirely satisfactory thrust bearing and throwout device for our clutches; we attempt to lubricate the thrust bearing by delivering oil from the transmission through a passage in the shank of the drive-gear. This passage was connected by radial holes with the thrust bearing. If we make these holes large enough to insure sufficient lubrication at all times, occasionally the flow will be so excessive as to drain the transmission. We have tried a felt damper in the drive-gear but this has proved only partly successful because so many different kinds of transmission lubricant are used. Now, I have noticed that Mr. B. does not provide any means for lubricating the thrust bearing, but uses a type of thrust bearing quite different from ours. As he has been using this bearing for a long time we have decided to adopt Mr. B.'s type of thrust bearing.

Mr. B. squirms a bit and then confesses he has not been

entirely free from thrust-bearing trouble and even has thought seriously of trying the type Mr. A. was about to abandon. Everyone was thus brought into the discussion, and it was decided to make a careful study of the problems involved in the design of the clutch throwout. This was done, and eventually led to a new arrangement of the parts which insures uniform distribution of pressure on the bearing and permits lubrication from the outside with a minimum of trouble.

A gratifying amount of constructive work was brought about by these confessions. Patriotism impelled each one to disclose everything he knew about transmission design and to state freely his experience with the devices suggested. Those with improvements which they expected to incorporate in their product sometime in the future submitted ideas with commendable frankness. With nearly all the transmission makers of the country working together with such a splendid spirit, great progress was made, and at a meeting held June 2 in Washington, four makers decided to join in designing a new transmission for the Class A truck. Several other makers signified their willingness to adopt the new design later if they were called upon by the Government to make transmissions for Class A trucks.

As so much preliminary work had been done in previous meetings and by the engineering departments of transmission makers the main features of the new transmission design were quickly decided on, and the Ball and Roller Bearings Division of the S. A. E. Standards Committee was requested to recommend bearing sizes. The sizes of ball bearings it recommended were considerably larger than used in commercial practice, but the bearing engineers insisted that for military use they could not approve smaller sizes. Stress diagrams were made for all bearings, gears and shafts. At the meeting held June 20 in Columbus a tentative design was submitted. At this time drawings of most of the details had been made, but at this historical Columbus meeting the Government told us it would adopt one design only for each detail part of the A & B Trucks "to the last screw, bolt and nut." The transmission makers had progressed so far in this direction that it was an unbroken continuance of their work to consider the transmission and clutch for the Class B truck, which the Government stated was needed first.

Design Started July 30

The Government asked for volunteers among S. A. E. members to go to Washington and design two sizes of military trucks. The desired number quickly volunteered and were called to Washington July 30, when the different groups commenced at once to consider their particular problems. The B transmission is of the amidship type with four speeds forward and one reverse. The main shaft and countershaft are located in a horizontal plane with the idler gear-shaft above and to the left looking from the rear forward. The horizontal type was adopted in order to get the ground clearance specified, 18 in. below the transmission at a point midway between the front and rear wheels.

The transmission weighs about 230 lb. The case is of aluminum. The front is supported by a 6-in. trunnion within which is mounted the outer drive-gear bearing. The rear is supported by two steel forgings bolted and doweled to the back of the case. The fact that the main shaft and countershaft are in a horizontal plane, and that the idler gear is placed above minimizes the depth below the main shaft.

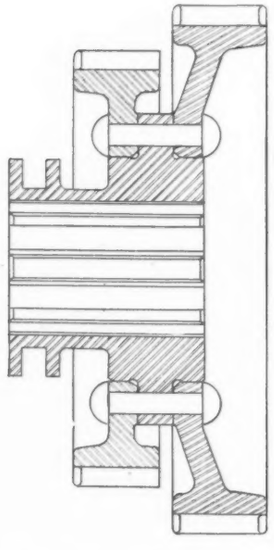
Gear and Tooth Sizes

The gears are 5-7 pitch, 6 in. from center to center of main shaft and countershaft. The width of gears increases from 1¼ to 1½ in. from the constant mesh gears to the low, according to the tooth pressure developed and the work it is expected each speed will be called upon to do.

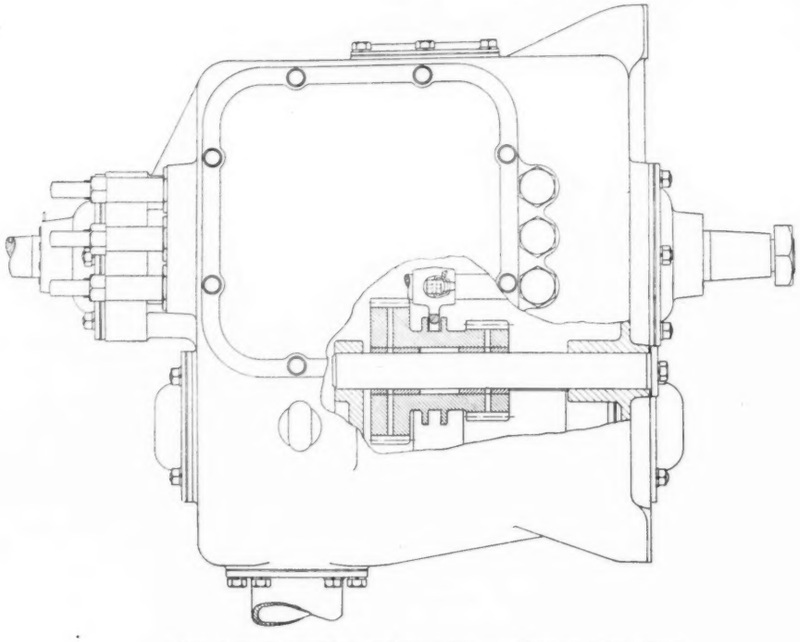
The speed ratios are 5.93 to 1 on first and reverse speeds, 3.23 to 1 on second, 1.76 to 1 on third, and direct on fourth speed. As the rear axle reduction is 9.5 to 1 this gives a total reduction of 56.335 on first and reverse.

It is common practice in transmission design to have the reduction considerably greater on reverse than on first. The ordinary four-speed transmission arrangement with a ratio of 5.93 on first would have one of 6.78 on reverse. A total reduction of 56.335 was considered ample to secure the tractive factor desired in the Class B truck under almost any road conditions, so it was decided to make the ratio on reverse speed in the transmission the same as on low, all working parts to the rear of the transmission can thus be made lighter than would have been required if the usual practice had been carried out, of having the reduction reverse greater than on low speed. The countershaft first-speed gear is forged integral with the countershaft. The other countershaft gears are held with a single key.

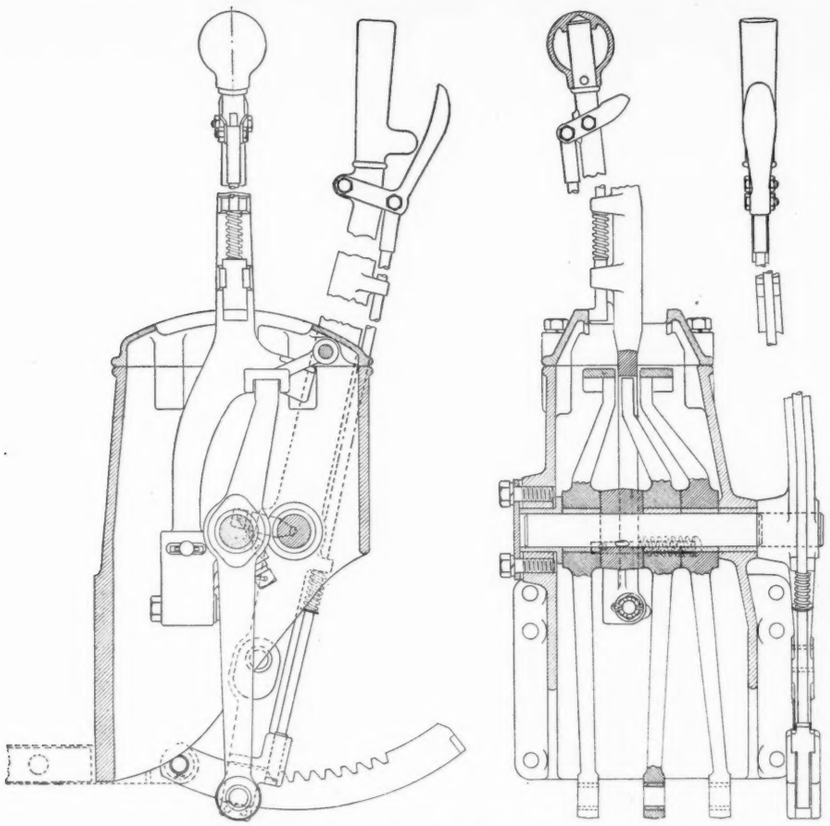
The reverse idler gears are made from an integral forging. The shifter slot is between the gears. All gears are made from forgings. The main shaft is 2¼-in. S. A. E. six-spline, ground all over except where threaded. A clearance is provided over the splines in the keyways of gears, the working fit being in the ground bore of the gear.



Sliding pinion unit



Plan view of gearbox broken away to show reverse gears

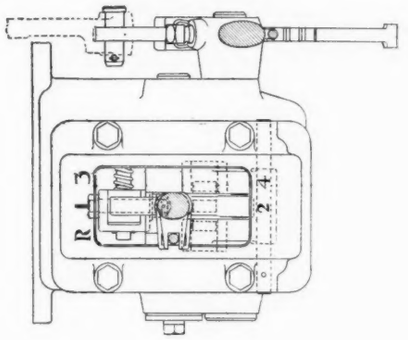


Three views of the selective control mechanism

All shafts are specified alloy steel equal to 3½ per cent nickel in physical properties, properly case hardened. Gears may be made of alloy steel equal in physical properties to 3½ per cent nickel. The steel may be high carbon properly heat-treated or low carbon properly case-hardened. All the gears are now being made of 3½ per cent nickel steel, low carbon case-hardened.

The lower part of the mesh lock-plungers are wedge shape. Instead of leaving a thin straight end, the end is machined concave and rounded off. This design gives greater wearing surface than the cone-pointed plunger and the concave end prevents the plunger from turning around. There is no inter-lock in the transmission, but a positive inter-lock is provided in the control set. The control set is a rocking-lever type.

Annular ball bearings are used for drive-gear shank, main-shaft case bearing and countershaft. The main-shaft spigot-bearing is of the solid roller type running directly on the pilot on the end of the main shaft and in the end of the drive gear. Plain phosphorus bronze



bearings are used for the idler gears. The drive-gear shank terminates in a 1½-in. S. A. E. taper and the main shaft in a 1¾-in. S. A. E. taper.

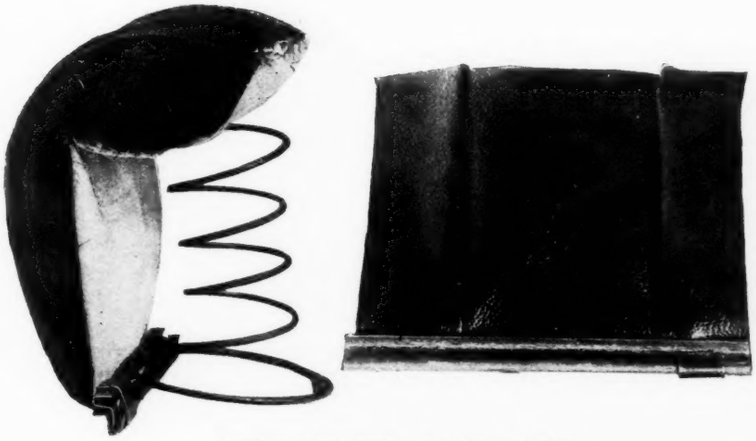
Although the several units of the Class B truck were designed by separate groups, the different groups kept in close touch with each other and the result is a truck of balanced design. The Class B transmission is in no sense a compromise design. Each part of the design had practically the unanimous approval of the transmission engineers on the job, and in most cases represents successful current practice. It is confidently expected to give a good account of itself under the most trying conditions on the battle front. Throughout the whole design S. A. E. Standards were used just as fully as they were available.

The speed-change H-plate is the S. A. E. recommended practice. No rocker arms are used in the transmission. The shifter forks are fixed to the shifter rods by hardened screws having special taper ends. The shifter forks are as short as the diameter of gears will allow. The arrangement is such that the shifter rod nearest to the idler gear is the one used for reverse. Grooves of 90-deg. V-shape are used.

Hayes Metal Base for Automobile Seats

THE Hayes Mfg. Co., Racine, Wis., has developed a new metal base for automobile seats, on which a patent has been obtained. A photograph of the construction is reproduced herewith. The base is very simple but is exceptionally strong and inexpensive to manufacture. Its use is claimed to result in a saving of both material and labor, and it should therefore appeal to car makers.

In trimming a seat with this base, the raw edge of the leather is brought over the extending flange. The locking or clamping strip is then applied and the seat is finished. The operation of trimming is said to require 2 min. per seat and there is no necessity for tacking, stitching of the leather, or sewing on of the welt for binding. Any style of trimming can be used, viz., plain, pleated, piped, etc. The Hayes Company is now ready to place the base on the market and expects a wide demand for it.



Showing metal base in section and plan

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The Automobile

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Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, General Manager
231-241 West 39th Street, New York City

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The Military Motorcycle

OWING to the somewhat different organization of the motorcycle industry as compared with the truck industry, a different procedure has to be followed in the design of a motorcycle for general army use from that followed in the development of the army trucks. The great majority of motor trucks just previous to this country's entrance into the war were assembled from parts purchased in the open market, and the manufacture of truck parts was well organized. Therefore, when the problem of designing motor trucks for the army arose, groups or committees of engineers experienced in the manufacture of the different units were formed, and each group was entrusted with the task of designing a part for the Liberty truck.

There is practically no parts industry associated with motorcycle manufacture. Every motorcycle factory produces its own engines, transmissions, frames and other major parts. Therefore, there are no motorcycle parts specialists and it was not possible to evolve the standard motorcycle or Liberty motorcycle on the parts committee plan. Also, once the design is completed it will not be possible to let contracts for the manufacture of the different parts to factories experienced in that particular work unless the contracts are made with the established motorcycle manufacturers.

The plan worked out by the men in charge of the motorcycle branch of the department of motor transport was to select a number of motorcycle factories producing a type of machine similar to the one required, and with the aid of the engineers of these factories evolve a composite design using the engine of one factory, the transmission of another and the frame of the third. The advantage of this plan is that as soon as the design is completed one factory is already tooled up for each of the major parts of the machine. It may be readily imagined, however, that many difficulties will crop up in fitting together —in the course of evolving the composite machine— parts that were not primarily designed to go together. This may necessitate changes in the design of some of the parts of such nature that the tools used for its production become unsuitable or require extensive alteration. Also, there is a chance for differences to arise as to the selection of the parts, though the commendable spirit in which the motorcycle makers have co-operated in the past gives assurance that all difficulties will be smoothed out and the motorcycle program will be carried through with the same dispatch and efficiency as the motor truck program.

Aircraft Engine Types

IN motor truck work the four-cylinder vertical engine is in almost universal use, and in the tractor field the same type of engine is rapidly forging to the front and bids fair to attain a commanding position before many years have gone by. That there is no such uniformity of practice in the passenger-car field is due to the peculiar conditions affecting sales in this field. One might say that the passenger-car problem is not a straight engineering proposition. So many different requirements are made and the limitations of purchasers in respect to the prices they can afford to pay vary so widely that it is probable that we will not be able to settle on one or two engine types as most suitable for all passenger vehicles for a great many years to come.

In aircraft engineering almost every conceivable type of engine has had its try-out, from the two-cylinder opposed up to the eighteen-cylinder W type.

Owing to the fact that the power required has jumped by leaps and bounds and that any engine under 150 hp. is of little use to-day except for purposes of instruction, no engines of less than six cylinders are now used in actual warfare. The six-cylinder vertical engine is supreme in Germany, Austria and Italy. It is the simplest engine, having a perfect balance of reciprocating parts and it has been built in units up to 400 hp.

When the power required is more than this the plane can be fitted with two or more engines, and the Germans seem to prefer this plan to increasing the cylinder number.

In this country we have been featuring the Vee engine for the last four or five years, first for auto-

mobile and now for aircraft work. It is undoubtedly possible to build a Vee engine lighter than a vertical engine of the same horsepower within the power ranges required for military aircraft nowadays, chiefly because of the great saving in weight in the crankcase of the Vee, but there is a compensating disadvantage in the Vee in the greater resistance it offers to motion through the air. It is this factor of high head resistance which has entirely eliminated the radial stationary cylinder engine from the aircraft field and has greatly hampered the rotating radial engine. To minimize the head-on resistance, builders of Vee engines sometimes make the angle of Vee as small as constructional limitations permit and smaller than necessary to insure uniform spacing of explosions. In the twelve-cylinder engine the balance is not dependent upon the angle between the two-cylinder blocks, and angles of 50 deg. and even less have been used. In the eight-cylinder engine, if the angle is made less than 90 deg., not only is the sequence of explosions disturbed but the balance is rendered worse. Hence eight-cylinder engines heretofore have always been made with a 90-deg. angle, though we understand that experimental work is now going on with engines of a smaller angle of Vee.

An increased head resistance is equivalent to reduced power and the endeavor to overcome it at some cost in respect to other desirable features is therefore understandable.

There have been many attempts to go beyond twelve cylinders in aircraft engines, but whether any advantage can be secured seems problematical. Higher speeds would be possible with the multi-cylinder engines, but as the propeller does not operate efficiently at high speeds this feature cannot be taken advantage of except by the use of reduction gearing, which is objectionable. Crankshafts of enormous size have to be used in any case to transmit the power and these will also withstand the explosive and inertia pressures consequent upon the use of fewer and larger cylinders. The eighteen-cylinder would seem to be the most logical step after the twelve-cylinder, but we understand that experiments with sixteen-cylinder constructions are under way.

Private Aircraft Engine Development

WHEN the standardized aircraft engine program was first disclosed it was of an all-inclusive nature. The U. S. A. engine, as it was then referred to, was to be made in four, six, eight and twelve-cylinder models, all with the same size and design of cylinder. After production was once well started these engines were to be used for all requirements of our aerial forces. The announcement had the effect of subduing private enterprise in developing new types and more efficient forms of engine. If it had not been for this, the $640,000,000 appropriation would have mightily stirred designing talent throughout the country.

It seems now that plans have been somewhat modified. While the Liberty engine program is being proceeded with as fast as possible, manufacturers of other efficient engines will be given a chance. New foreign engines are being put in production here and there is considerable activity in American drafting rooms on new designs. The aircraft authorities of the allied nations do not favor the policy of putting all eggs in one basket, though they fully realize the advantages inherent in one-design engines from the standpoint of both production and replacements. The feeling here seems to be that the demand for engines will be so great that the Government cannot afford to refuse the purchase of any good engines offered to it.

Your Responsibility

TO win the war we need to do things—to do them quickly, with less man power and less waste. This means increased activity. It means more efficient use of every piece of equipment with which the work is to be done. It means more efficiency of all the equipment that we employ. We are not getting the maximum of activity. We are not getting the maximum of activity because the great arteries of transportation, which speed our material to us and distribute our goods for us, are overloaded. Our railroad facilities are too small. Eight years ago James J. Hill said that unless we put a billion dollars a year for five years into railroad facilities, they would break down under the growing load. We did not provide the money and, consequently, the railroad facilities are not large enough. Neither the efficient control of the Government nor the wisdom of the railroad men can solve the present freight difficulty. The transportation problem is your problem. It is our problem. If we are to maintain our business as members of the third largest industry in the country, an industry intimately connected with a flexible unit transportation, which can be used where railroads cannot go, which can be used to relieve the railroads, it is up to us to solve the transportation difficulties of our own business by the efficient use of the transportation equipment which we are manufacturing and to apply our industrial knowledge and organization to the work of constructive suggestion for the improvement of the general transportation situation. By practical application of this flexible unit transportation equipment, the railroads can be relieved of a burden too great for their equipment and facilities to take care of.

A time of emergency such as this is no time for sitting back and letting matters take their own course. It is a time to do things. In each manufacturing center in the automotive field there is a sufficient number of far-sighted business men acquainted with the practicable possibilities of these transportation facilities to work out methods by which, in a creditably short time, a large measure of relief can be applied to the situation. The automotive industry can undertake for itself and suggest to others relief measures which will aid the Government and obviate the necessity of Governmental action, which must be slow—and unsuited to local conditions.

Latest News of the

Stettinius May Head War Board

Need for Centralized Authority Would Give Board Greatly Enlarged Powers

WASHINGTON, Feb. 6—It is probable that Edward R. Stettinius will be placed at the head of the War Industries Board and that this board will be given greatly enlarged powers similar to those mentioned in the Chamberlain Bill. It is said that President Wilson recognizes the need for centralized control but desires that such control be lodged in the War Industries Board, which is an experienced, established body, rather than in any new board which might be created. If Stettinius is so appointed, and in view of the new priority rulings which are outlined in another column, H. L. Horning, chairman, Automotive Products Section of the War Industries Board, will have considerably enlarged powers and it will be necessary to install various departments in order to control priorities and the approval of orders. Under the new priority ruling each division of the Government will pass on priorities affecting its particular work. For example, the Automotive Products Section will pass on priorities regarding trucks.

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Quartermaster Trailers Shipped

CLEVELAND, Feb. 7—The first of the new 1½-ton Class A four-wheeled Quartermaster trailers have been shipped from this city and Detroit. Another concern has some parts for Ordnance Department trailers.

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No Airplane Mechanics Shortage

WASHINGTON, Feb. 7—There will be no shortage of airplane mechanics. Statistics gathered by the National Advisory Committee for Airplanes from records of the Signal Corps show that this branch of the service is well organized and able to supply the requisite number of repairmen to keep our fleet in action after it gets well started. Thousands of enlisted men are now in training in various schools and manufacturing establishments, and the work is being enlarged constantly. Engine mechanics for the four motor mechanic regiments now being organized at Camp Hancock, Augusta, Ga., have been and are being obtained by a system of selection from the national army. Men of required qualifications have enlisted in the aviation service already. The balloon service is able to get practically all the men it requires by selection from the aviation recruits. The necessary training to make the men work as a team is given to them at the various balloon schools.

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Republic Men from Tractor Company

ALMA, MICH., Feb 6—Interests closely affiliated with the Republic Motor Truck Co. have formed the R. & P. Tractor Co., which will start with $5,000 capital and manufacture a tractor embodying the ideas of F. W. Ruggles, president of the Republic company, and Channing Parsons, formerly general manager of the same company. The company will commence manufacture in a wing of one of the Republic buildings. Ruggles is president of the tractor company, other officers being: Vice-president and general manager, Channing Parsons; secretary, Harry Green; treasurer, T. A. Burt; directors include the officers and F. L. Smith.

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Reo to Make Worm Drive Truck

LANSING, Feb. 7—The Reo Motor Car Co., which has been making only a 2-ton chain-drive truck, is now experimenting with a worm-drive truck of the same size and similar design. This will be ready by spring, but no details of it are available yet.

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Durant to Confer on Fuel

WASHINGTON, D. C., Feb. 7—W. C. Durant, who is chairman of the committee which was appointed to confer with Dr. Garfield, was to have called a meeting last week but did not do so. It is understood now that he will either call an informal gathering to-morrow or for the early part of next week. Henry Ford was in Washington yesterday and conferred with Dr. Garfield about fuel.

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Stewart Warner Earnings $2,200,774

CHICAGO, Feb. 7—Net earnings of the Stewart Warner Speedometer Corp. for 1917 were $2,200,774, which is approximately 19 per cent on the capital stock. This is figured before the deduction of income and excess profits taxes, for which a reserve of $340,000 was set aside. During the year $600,000 was paid out in dividends, and a total unappropriated surplus of $5,456,215.38 still remained on Dec. 31. The net earnings for 1916 amounted to $2,215,042.

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New Grant 3½-Ton Truck

FINDLAY, OHIO, Feb. 7—The Grant Motor Car Corp. is designing a new 3½-ton, internal gear truck, and expects to have a model completed in 2 or 3 months. No details are available yet, except that the truck will have Torbensen rear axle and a Continental engine.

Chicago Show Draws 150,000

More Than 8,000 Dealers — Great Interest of Farmers Deemed Significant

CHICAGO, Feb. 2—The Chicago motor car show as the intrinsic business criterion of the industry has vindicated itself. The total attendance is put down as 150,000. The show resulted in heavy retail sales and drew a large number of dealers, estimated at eight thousand, this being more than double the number that ever attended before. These men represented the Mississippi Valley and the vast area to the north, west and south of it to our boundaries.

The large dealer attendance is significant and indicates that the agricultural districts of the country are anticipating a large business with the coming of spring, at which time the farmer will be able to move his heretofore transportation-bound product to market and thus stimulate business. This is an event toward which dealers must look forward with foresight and optimism. It must be met with American business methods.

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Fifth Foreign Trade Convention Meets

CINCINNATI, Feb. 7—The Fifth National Foreign Trade Convention, called together by James A. Farrell, chairman of the National Foreign Trade Council, will meet to-day at the Gibson Hotel and will continue to-morrow and Saturday. The following subjects will be discussed: Foreign trade achievements in the past; after-war conditions of foreign trade; exports and imports control; foreign credits; education for foreign trade, and the merchant marine.

The convention will hold its banquet Friday evening, Feb. 8, at 7 p. m. The Government is co-operating with the council to make trade information and advice concerning foreign trade markets available.

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Chalmers Corp. Reduces Common Stock

NEW YORK, Feb. 7—Stockholders of the Chalmers Motor Corp. at the annual meeting held here yesterday voted to reduce the authorized common stock from 532,000 shares, no par value, to 400,000. The 132,000 shares involved are unissued but authorized stock, held in the treasury. The following board of directors was elected: Jules S. Bache, J. Horace Harding, Hugh Chalmers, Henry E. Butler, George C. Van Tuyl, Jr., Joseph H. Clark and W. P. Kiser.

Automotive Industries

Duesenberg Buys Fiat Plant

Use Equipment to Enlarge Elizabeth Plant Now Devoted Exclusively to Airplane Engine Work

NEW YORK, Feb. 5—The Duesenberg Motors Corp., Elizabeth, N. J., has purchased the buildings and equipment of the Fiat Co., Poughkeepsie, N. Y., and will commence immediately to remove the bulk of the equipment to its Elizabeth plant. The Fiat company will continue to occupy a part of the buildings and the production and assembly of Fiat cars will go on much as usual.

The Duesenberg company purchased this property and equipment in order to obtain immediately a large amount of machinery with which to carry on the production of airplane engines for the government. At the present time, Duesenberg is concentrating its entire manufacturing facilities on the production of Bugatti airplane engines for which it has a large contract. The production of Duesenberg engines has been entirely stopped, though at some future time arrangements may be made with some Western engine builder to manufacture the small Duesenberg four.

Present plans of the Duesenberg company are to move a large part of the machine tool equipment from the Poughkeepsie plant to Elizabeth as soon as facilities for its reception can be completed. This will double the capacity of the plant. Eventually, it is planned to have new machinery, which is due to be delivered early in the summer, installed in the Poughkeepsie plant, where some of the minor machine operations will be carried on. The purchase includes all the Fiat buildings and about 30 acres of land.

The Fiat company states that it has no intention of stopping the manufacture of cars and that this work will be carried on indefinitely with but little interruption.

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Urge Water-Power Development

WASHINGTON, Feb. 6—The United States Chamber of Commerce is conducting an investigation with a view to ascertaining the sentiment for legislation to encourage the development and conservation of the water power resources of the United States. A questionnaire is being sent out to more than half a million American business men to obtain a referendum vote which it is expected will be of influence on Congress in indicating how the business men of the country look on the water power question. The committee on Water Power Development recommends Federal legislation encouraging the development of water power with permits for a period of at least 50 years. It is estimated that the undeveloped water power of the country exceeds the total steam power now in service.

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Two More 4-Day Shut-Down Periods Considered

WASHINGTON, Feb. 6—Instead of eliminating future heatless, workless Mondays in the industries, it is understood now that Fuel Administrator Harry A. Garfield is seriously considering two more four-day shut-down periods. One of these would include Lincoln's Birthday and the other would include Washington's Birthday. It is understood to be the plan of the Fuel Administration to make two such periods of industrial suspension take the place of the remaining heatless Mondays.

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Build Airplanes in Middle West

WASHINGTON, Feb. 6—Howard E. Coffin, chairman of the Aircraft Production Board, is authority for the statement that "fully fifty per cent of the airplanes constructed for the United States Government will be produced in factories in the middle West." It is the plan, as the program for construction expands, to use many of the plants in the middle West sections where woodworkers are now employed on furniture, pianos and other goods less essential to the winning of the war.

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G. V. Interests for Aeronautical Engine Company

NEW YORK, Feb. 5—Interests allied with those of the General Vehicle Co., Long Island City, whose plant was taken over by the Government recently for the production of airplane engines, have formed the Aeronautical Engine Co. This company will take over the aircraft work of the General Vehicle Co.

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Franklin to Make Rolls-Royce Airplane Parts

NEW YORK, Feb. 5—Contracts for parts for airplane engines for the allied governments continue to be let to automobile manufacturers. Among the latest reported to receive such contracts is the H. H. Franklin Mfg. Co., Syracuse, N. Y., which, it is understood, will make 1500 crankshafts for the Rolls-Royce aviation engines. Others working on similar contracts are the F. B. Stearns Co., Cleveland, and the Taft-Pierce Mfg. Co., Woonsocket, R. I.

Probe Airplane Plans in Senate

Investigation Reveals Spruce Shortage—Continue Monday Closings—Other Washington News

WASHINGTON, D. C., Feb. 4—The chief event of the past week here was the investigation of airplane activities by the Senate Military Affairs Committee. For military reasons the majority of the sessions were in secret, but the few open meetings served to show both progress and procrastination.

The greater part of time of the open sessions was consumed by Major Charles Sligh, who used the time of the committee to dwell at considerable length upon his personal troubles with Howard E. Coffin, chairman of the Aircraft Production Board, and Col. E. A. Deeds, of the Signal Corps. He charged them with neglecting certain recommendations he made, but in several instances was induced by skillful questioning on the part of Senator Chamberlain to admit that the blame was to be placed with the head of the War Department, instead of with either Coffin or Col. Deeds.

The most important testimony in open session related to a considerable shortage of spruce for planes. This was attributed rather to the procrastination of big Western lumber interests than to the Aircraft Board.

Coffin, always demanding secret hearings, dwelt chiefly upon airplane design, changes of type, training of aviators, airplane production and aviation tactics in war. According to Senators who questioned him in the final hearing last Saturday, Coffin made a detailed statement which was regarded by the Senators of the committee as favoring definite affirmative action in support of the bills for a War Cabinet and Munitions Director.

In one sense it was unfortunate that Coffin called for a secret hearing Saturday. The testimony of Thursday and Friday tended to show inefficiency in our aviation activities, which was the reason that Mr. Coffin was recalled for explanation. Had this last hearing been an open one it would probably have served to dispel the doubts in the public mind as to our actual progress.

Late last week a joint statement by Dr. Garfield, Fuel Administrator, and William G. McAdoo, Railroad Administrator, was to the effect that they are considering suspension of the Monday closing order. They will hold a conference again to-morrow on this matter, at

which time a decision will be reached.

The conference of last week, and the partial decision to countermand the Monday closing order, was induced in great part by a speech by Congressman Smith of Michigan, in which he showed that the closing of industry in Grand Rapids last Monday produced an actual saving of 6 tons of coal, at a cost of over $22,000.

He showed that it required almost as much coal for the furniture factories to start again as was saved.

In addition, he discussed the situation in Detroit, taking for example Dodge Brothers, who, he stated, had their force dissipated 70 per cent by the order, despite the fact that they are working on munitions for the Government and have a full supply of coal on hand.

He testified that Dodge Brothers are making cannon for our army and purchased 100,000 tons of coal last February, which has been delivered. From their coal pile they supplied 3000 families in Detroit who were permitted to come and take and use the coal. Mr. Smith went on further to show that the Monday closing order "did not save an ounce of coal or relieve congestion anywhere."

Normal Labor Conditions

Labor conditions, according to placement figures of the Department of Labor, are normal. These figures, issued monthly, show the numbers of men seeking work, and the numbers of employers seeking labor. There has been little change in the figures for any time in the last twelve months.

The department, through its new employment reserve service, is enrolling thousands of workers throughout the country for work in the shipyards, in anticipation of the demand for such workers in the next 6 months.

An important result of the first week of this enrollment is that great numbers of those enrolling are men now out of work, and seeking immediate employment—definite proof that there is no such labor shortage existing as some agitators would have us believe.

The department is still insisting upon a sane course for the handling of wartime labor conditions, and has established several new bureaus to maintain a broad national labor policy. A Publicity Division has been appointed, which aims to tell the public that labor is merely a matter of adjustment, during the present emergency, and not a question of labor shortage. It will point out through its publicity channels that while there are shortages of labor in some localities, there are surpluses equally great in others.

The word non-essential, as applied to industries, has again been heard in Washington in the past week, when a conference of state directors of the Public Service Reserve endorsed the "conversion of non-essential industries rather than the establishment of new factories." These directors no doubt are unaware that official Washington has learned that

(Continued on page 339)

Federal Licenses for Fuel Oil Men

Transportation Difficulties, Not Shortage, Necessitate Government Action

WASHINGTON, Feb. 5 — Manufacturers and distributers of fuel oil with gross sales of more than 100,000 barrels a year after Feb. 11 must have Federal licenses to do business. Although there is an abundant supply of oil, transportation difficulties have made such action necessary and President Wilson has taken this step. The distribution of fuel oil is to be under the direction of the oil division of the Fuel Administration, headed by Mark L. Requa. There is no intention to extend this emergency measure to cover gasoline and kerosene which are not included under the term fuel oil.

Coincident with the President's proclamation Fuel Administrator Garfield has made public the following list which will govern priority of deliveries:

1—Railroads and bunker fuel.
2—Export deliveries or shipments for the U. S. army or navy.
3—Export shipments for allied navies and other war purposes.
4—Hospitals where oil is used for fuel.
5—Public utilities and domestic consumers now using oil (including gas oil).
6—Shipyards engaged in government work.
7—Navy yards.
8—Arsenals.
9—Plants engaged in manufacture, production and storage of food products.
10—Army and navy cantonments where oil is now used as fuel.
11—Industrial consumers engaged in munition manufacture and other articles under government orders.
12—All other classes.

The new order has been necessitated entirely by the inadequacy of transportation facilities. According to a statement issued to-day: "The oil supply is abundant."

At present Dr. Garfield and his advisers feel that there is no reason for the extension of the order to cover control of gasoline and kerosene.

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Five Truck Trains Near Destination

WASHINGTON, Feb. 4 — The five motor truck convoys en route to the Eastern seaboard from Detroit are nearing their destination. The convoys have had to contend with the most severe winter storms, and in a number of instances were snowbound for two and three days at a time. The convoys are traveling one day apart.

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50 Cars Sold at Chicago Salon

CHICAGO, Feb. 5—Chicago's salon in the Elizabethan room of the Congress Hotel reflects the same spirit of optimism that is noticeable at the Coliseum, and between 50 and 60 cars have been sold. The attendance this year was better than in 1917. The salon exceeded all expectations in the number of visitors as well as the amount of business done. The Elizabethan room permitted the exhibition of only 20 cars as against 80 in New York. Unless war conditions make it impossible, space next year will be doubled or tripled.

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Scientists to Test Garabed

WASHINGTON, Feb. 4—Garabed, the new free energy which has been discussed in Congress and is supposed to have been invented by G. T. K. Giragossian, will be tested in Boston shortly by eminent scientists to be selected from the faculties of Harvard, Yale, Massachusetts Institute of Technology and the Worcester Polytechnic Institute. It was learned here to-day that just before the resolution was passed authorizing the tests the British Embassy promised the inventor that if the United States Government did not accept the invention Great Britain wanted the opportunity to do so.

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Armitage President of Whitman & Barnes

AKRON, OHIO, Feb. 1—A. D. Armitage was elected president of the Whitman & Barnes Mfg. Co. at the annual meeting of the stockholders held here yesterday. Frank A. Seiberling was appointed a director to succeed A. B. Rinehart, former president of the company. At the meeting the regular quarterly dividend of 1½ per cent and an extra dividend of 1 per cent, payable Feb. 15, were declared.

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Globe Truck Elects Officers

EAST ST. LOUIS, Feb. 5—The Globe Motor Truck Co., at its first annual stockholders' meeting, elected the following officers: David A. Marks, president; Christopher Beckemeier, vice-president; Nansen J. Marks, secretary. David A. Marks, Louis Hughes, George Baeker, John Soy, George Chapline, Christopher Beckemeier and William G. Meiher are the directors. The company was formed in January, 1917.

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New Bell 1½-Ton Truck

YORK, PA., Feb. 5—The Bell Motor Car Co., Inc., will manufacture a new 1½-ton truck with internal gear drive and wheelbase of 112-124-136 in., in the factory it recently purchased from the Pullman Motor Car Co., York. It will also bring out a new model Bell passenger car.

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Miller Top Elects New Officers

CARO, MICH., Feb. 2—The following officers of the reorganized Miller Top Co. have been elected: President, Max Zemke; vice-president, Peter Miller; secretary and treasurer, M. G. Atwood. These three, with N. B. Atwood and D. L. Lazelle, constitute the board of directors.

Slight Decrease in 1917 Exports

Few Trucks Shipped in December—Month's Total Largest for Entire Year

Mos.	Cars	Value	Trucks	Value	Parts
Dec..	6442	$5,375,706	825	$1,585,481	$4,952,465
Nov.	5006	4,820,738	1435	3,430,162	2,535,230
		1916			
Dec..	4911	3,658,660	1331	3,689,314	1,755,333

WASHINGTON, Feb. 5—In spite of the fact that the truck exports during December were less than half of the November amount, the total exports show an increase of $1,127,522 over the previous month, and an increase of $2,810,445 over December, 1916.

The total amount of exports for 1917 is slightly lower than that for 1916, the difference being less than $1,000,000. There was a great increase in the number of passenger cars shipped last year, but truck exports have fallen off considerably.

Canada was by far the largest purchaser of passenger cars during the year, and the United Kingdom bought three times as many trucks as any other country. Argentina follows Canada in the number of passenger cars bought, with only one-fourth of the number. Chile is third in the number of cars bought, but second if value is considered.

Great progress was made during the year in the number of trucks shipped to Russia. Strangely enough, Russia in Asia received twice as many as Russia in Europe.

Although South America is a good market for passenger cars and parts, not one truck was shipped there.

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To Make Unit for Ford Cars

YOUNGSTOWN, OHIO, Feb. 6—The Lau Iron Works, manufacturer of the Elton truck unit for Cadillac cars, will also manufacture a truck unit for Ford cars.

December Gasoline Exports Drop

NEW YORK, Feb. 5—Gasoline exports in December amounted to 35,335,977 gallons valued at $8,674,987. This is a drop of 40 per cent from the amount exported in November, which was the largest month of the year, but show a 50 per cent gain over the exports in December, 1916.

The total amount of gasoline exported during 1917 was 416,249,063 gallons, at a cost of $93,166,692. This is an increase of 16 per cent in quantity and 30 per cent in value over 1916 exports.

The average price in December, 1917, was approximately 24 cents a gallon, about 5 cents more than in December, 1916. The Allies are the largest importers of gasoline, buying it chiefly for war purposes, since civilians in neither France nor England may use it under ordinary circumstances.

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Franklin Sales Increase 135 Per Cent

BOSTON, Feb. 5—Sales of Franklin cars during 1917 increased 135 per cent over 1916, according to figures given out by the Franklin Mfg. Co. The greatest production was in October, when 294 cars were turned out in a single week. The company's business during the year amounted to $16,000,000. The last buildings needed to bring the company's capacity up to 15,000 cars a year are now completed and in use.

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$37,898 for Pullman Creditors

YORK, PA., Feb. 2—Receivers for the Pullman Motor Car Co. have filed a report with Judge Charles B. Witmer, of the United States District Court at Scranton. Unless exceptions are taken to the accounts of the receivers within 30 days the report will be finally confirmed at the March session of the district court. The receivers' report shows a balance of $37,898.36 for distribution among creditors.

Goodrich Net Profits $12,675,000

Preliminary 1917 Report Shows 33 Per Cent Gain Over Previous Year

AKRON, OHIO, Feb. 5—The B. F. Goodrich Co. made a preliminary report for 1917 yesterday, showing net profits of $12,675,000, before the Federal income and excess profits taxes are deducted. This is 33 per cent more than the net profits of 1916. The figures given out by the company follow:

	1917	Difference between 1916 and 1917
Net profits after provision for maintenance, depreciation, and doubtful debts.....	$12,675,000	Inc. $3,106,325
Provision for income and excess profits taxes.....	2,250,000	Inc. $2,250,000
Net earnings for dividends	$10,425,000	Inc. $856,235
Preferred dividends.	1,848,000	Dec. 52,000
Balance for common	$8,577,000	Inc. $919,235
Common dividends..	2,400,000	
Surplus	$6,177,000	Inc. $919,235

The surplus on Dec. 31, 1916, was $14,920,000, which added to the above made the total surplus on Dec. 31, 1917, $21,097,000. From this amount $900,000 was deducted and set aside for redemption of preferred stock, and $39,187 representing the reduction of preferred stock purchased from cost to par, making a total adjustment of $939,187. When this is deducted from the total surplus, there still remains $20,157,813.

The directors, subject to the approval of the stockholders at their annual meeting on March 13, have voted to retire 9,000 shares of preferred stock prior to July 1, 1918. This will make a total retirement of 45,000 shares

Exports of Automobiles, Trucks and Parts for December and 11 Previous Months

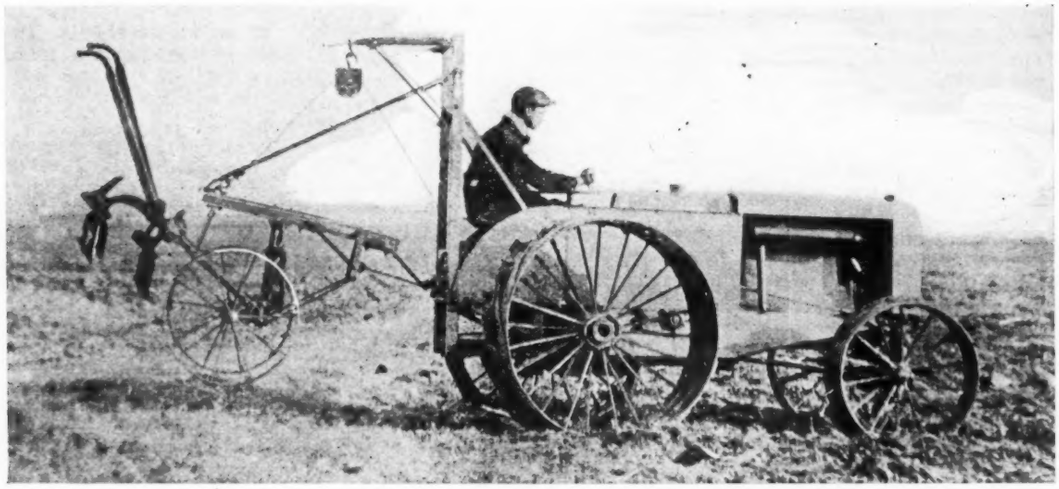
	December				Twelve Months Ending December			
	1916		1917		1916		1917	
	No.	Value	No.	Value	No.	Value	No.	Value
Passenger cars	4,911	$3,658,660	6,442	$5,376,706	61,947	$43,725,087	65,792	$51,982,966
Commercial cars	1,331	3,689,314	825	1,585,481	18,903	52,870,774	14,347	36,364,773
Parts, not including engines and tires.	.....	1,755,333	.....	4,952,465	.....	24,001,060	.....	31,523,754
	6,242	$9,113,307	7,267	$11,914,652	80,850	$120,696,921	80,139	$119,871,493

BY COUNTRIES 1917

	Passenger Cars		Trucks		Passenger Cars		Trucks	
Denmark	.....	.....	.....	.....	247	$ 223,616	.....	.....
France	285	$ 312,568	141	$ 634,420	1,634	1,217,583	2,683	$8,466,271
Norway	.....	.....	.....	.....	676	715,585	.....	.....
Russia in Europe	.....	.....	.....	.....	634	1,341,925	86	2,294,174
United Kingdom	39	118,096	219	411,165	1,349	1,978,948	7,574	20,111,759
Canada	1,852	1,318,786	92	118,038	16,438	12,401,705	822	1,075,750
Cuba	402	363,776	.....	.....	3,037	2,678,362	.....	.....
Argentina	270	225,309	.....	.....	4,171	2,808,869	.....	.....
Chile	536	601,118	.....	.....	3,937	3,481,061	.....	.....
British India	.....	.....	.....	.....	1,509	1,165,158	.....	.....
Dutch East Indies	129	131,741	.....	.....	2,273	2,215,040	.....	.....
Russia in Asia	.....	.....	.....	.....	260	419,463	193	622,883
Australia	426	358,534	.....	.....	4,561	3,557,852	.....	.....
New Zealand	71	51,779	.....	.....	2,753	2,080,919	.....	.....
Philippine Islands	254	216,895	.....	.....	1,243	959,683	.....	.....
British South Africa	207	170,944	.....	.....	3,396	2,492,399	.....	.....
Other Countries	1,971	1,507,160	373	421,858	17,674	12,244,798	2,389	3,793,936
	6,442	$5,396,706	825	$1,585,481	65,729	$51,982,966	14,347	$36,324,733

Maxwell Develops 3-Plow, Inclosed Transmission Farm Tractor

Has Detachable Head 4 x 6 Engine, Three-Speed Gearset and Final Drive by Bevel Gears Through a Differential—Can Be Used for All Farm Work and Also on Roads



The new Maxwell farm tractor is a versatile machine and can be used for practically every kind of farm work as well as for towing farm products to market over the roads

THE Maxwell tractor, which was held under cover until the Chicago show and then sprung as a surprise at the annual dealers' banquet of the Maxwell-Chalmers distributers, is of a type which would naturally be expected from an automobile manufacturer. This tractor has been under development for about 5 years. It was concealed under the name of the "Chief" and received its real try-outs on the sugar plantations of Louisiana.

The tractor is a three-plow machine giving a plowing draw bar up to 3000 ft. lb., with a normal output of approximately 2600. It is a four-wheel type, weighing 3600 lbs. with tanks empty, and drives through two 48 by 10 in. rear wheels by means of an enclosed transmission. The tractor is, throughout, what may be called an automobile type, for, although nothing about it follows automobile practice, yet the layout is such as closely parallels automobile design. The wheelbase is 6 ft., and the minimum tread is 44 in. This, however, is adjustable, as will be explained later. The tractor can turn in a circle of 21 ft.

A frame construction is used, consisting of two deep angles with the flanges turned in so that the entire frame structure is virtually a U section. In this U rest the engine and transmission and all the working parts. The frame is 7 in. deep and is of semi-flexible nature, with a flexible front support at the center of a transverse spring mounted on the front axle.

This construction gives a tractor which is not affected by the distortions due to inequalities of the ground. The construction of the tractor is of two main units, the powerplant and the transmission.

The backbone of the powerplant is made up of the cylinder casting, which includes the crankcase, and a bell housing. The second part is a casting, which includes all the transmission gears and extends from the bell housing back to the rear axle.

These two component castings bolt together at the bell housing, giving a rigid central construction for the working parts and form the two distinct structures which go to make up the principal part of the machine.

The powerplant is a three-casting unit composed of the cylinder block above described, a casting for the head, which is detachable, and a casting forming the oil pan.

The engine proper is a detachable L-head unit of very simple design. The cylinder dimensions are 4 by 6, although this may later be changed to 4¾ by 6 to fit into a proposed production schedule involving a truck unit of heavy capacity. Nothing definite, however, can be stated on this at the present time.

The L-head engine is conventional in every respect with the exception that the water jackets are of much greater capacity than usual. The jackets extend to the bottom of the cylinder, so that there is a straight wall on the outside of the cylinder directly down to the crankcase, giving a completely cooled unit of large water capacity.

The water area round the cylinder-head, which is a separate casting, is also particularly large with the water brought well around the spark plug aperture to eliminate any chance of hot points developing in their proximity.

The crankshaft is carried on three bearings and is a 2½-in. unit with all bearings 2½ in. in diameter. The connecting-rod bearings are 3½ in. in length and the main bearings are exceptionally large for the normal engine speed, which is 900 r.p.m. These bearings from front to rear are 3¾, 3½, and 4¼ in. in length.

An interesting oiling system has been worked out. It is one of the few truly combined pressure feed and splash systems, as both the pressure feed and the splash are relatively complete within themselves.

In conjunction with the oil pressure feed, which operates through a drilled crankshaft, there are three pumps, one pump being located at the forward end of the crankcase, one at the rear end, and the third taking the oil from the sump and delivering it to the three main bearings, from where it is led by the hollow shaft to the connecting-rod bearings.

With these three pumps, if the tractor has to climb a stiff grade, and the oil should run to the back of the case, the pump at the rear will carry the oil back to the sump, where it will distribute to the main bearings. Should the tractor

be inclined to the front the front oil pump will act in the same way. Thus, in spite of the difference in purpose, a hint has been taken from aircraft practice.

The water system holds 10 gal. Water is pump-circulated through a vertical tube radiator with cast tanks. Ignition is by magneto, the make of which has not as yet been fixed, the magneto being equipped with an impulse coupling for starting. The magneto is driven from the water pump shaft through a flexible coupling. Gravity gasoline feed is employed, with a 26-gal. tank mounted behind and above the engine. The fuel employed is gasoline, and the hot-spot manifold design is employed to provide for evaporation.

With this engine of the 4½ in. diameter type, 29 hp. is delivered at 900 r.p.m., which is the governed speed. The governor is a gear-driven unit on the same shaft as the fan.

A cone clutch faced with asbestos fabric is enclosed in the bell housing, and the service brake is mounted on the reverse side of the clutch. Thus when the clutch pedal is depressed, the cone, which has a diameter of 16 in. and a face width of 3 in., is first pulled out of the driving member and a further depression of the pedal results in bringing the brake into effect.

The transmission gearing provides three speeds, the ratios being such that on high gear the tractor travels 6 m.p.h. at 900 r.p.m.; on intermediate, or plowing speed, 2¼ m.p.h. at 900 r.p.m.; and on low, 1½ m.p.h. at 900 r.p.m. The transmission gearing is all mounted on anti-friction bearings, and none of the center to center distances of these bearings exceeds 14 in.

The final pinion has a 7 in. face and the rear axle gear a 6 in. face. All of these are chrome-nickel gears running in oil.

The drive passes from the clutch shaft through bevel gears to a transverse shaft. This engages in turn with a second transverse shaft, carrying the reduction gear, and from this second transverse shaft it passes back through the final pinion to the rear axle.

The first transverse shaft has a pulley on the right end and a winch or cable hoist on the opposite end.

By means of these two devices any work desired by farmer, contractor, or any other type of engineering farming or construction work requiring animal power or mechanical power can be performed. The tractor can lift itself off the ground if that is desired, or it can lift wagons to points where they can be dumped in their entirety if the tractor is used by contractors who need that sort of assistance.

The pulley makes it possible for the farmer to use the tractor as a stationary powerplant, and a snubbing block can be fitted over the pulley if desired for work in which a device of this kind gives more practical assistance.

The rear axle carries the differential mounted on the outside and the axle itself is hollow, and after it passes through the differential housing, it drives through tubular units which can be added to by inserting additional members which really form part of the rear axle, thus giving an adjustable tread.

This shows the appearance of the Maxwell tractor equipped for use on hard roads. The design is compact and follows the usual practice with the engine under a hood at front

The combination of the adjustable tread and adjustable draw bar and the provision of both cable hoist and pulley, or snubber block, together with shieve combinations, allow practically any work to be accomplished with this tractor that is desired. The load can be attached to the draw bar at any point, and if desired this can be used as a frame to which a small crane can be attached. The tractor has been designed throughout with an eye to maintenance, and all parts are readily accessible, the oil tubes, for instance, all being exterior so that they can be taken out and cleaned. There are two oil wells, one for the engine and the crankcase, and the other in the gearbox supplying all the transmission gearing. The oil is circulated in the gearbox by means of a gear wheel which picks it up and allows it to flow over to the surfaces.

The tractor is not in production as yet, but will be as soon as it is possible to co-ordinate the Maxwell-Chalmers plant which at the present time is doing considerable Government work. The manufacture of the tractor will not interfere with this, however, and production will not be long delayed. The price of the tractor is not fixed and cannot be until production is started and costs accurately estimated. It will naturally depend largely on the number scheduled. It can be predicted, however, that this tractor will take its place among low-priced machines.

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Hot-spot Manifolds Criticised

MINNEAPOLIS, Feb. 6 — Hot-spot manifolds for farm tractors burning kerosene came in for much criticism at the monthly meeting of the Minneapolis Section of the S. A. E. to-night, when Professor Mowry of Minnesota State University read a paper on "Tractor Fuels" before one hundred and twenty-five members of the section and their guests.

Professor Mowry gave reports of laboratory tests with different kinds of manifolds and showed the quantity of kerosene that entered the crankcase. With the Clapper manifold after a one-hour test with the engine running at 750 r.p.m. under full load 0.1 lb. was added to the crankcase oil. With a Holley vaporizer the engine speed had to be increased to 850 r.p.m. to give the same horsepower and 0.7 lb. was added to the crankcase oil. With a Duplex manifold the speed was 820 r.p.m. to give the same horsepower and 0.3 lb. was added to the crankcase oil.

W. G. Clark, engineer of the Bennett Carbureter Co., differed with Professor Mowry, contending that hot-spot manifolds cut down volumetric efficiency as much as 33 per cent and that it is necessary to use engines that are too heavy and that to-day engine weight must be reduced. The farmer objects to having a 40 hp. engine to give only 30 hp. just because a hot-spot manifold is used to permit burning kerosene.

With the use of a double manifold, the entire charge is heated but not to the same degree in all cylinders so that preignition is difficult to overcome. The volumetric efficiency is reduced too much, there is smoky exhaust and kerosene in the crankcase. Too many tractor makers declare they can run on kerosene but this statement is misleading. It is true they can run on it but they do not burn it as it should be burned.

Clark argued in favor of furnishing a dry gas from kerosene which is possible at a temperature of 110 deg. providing the manifold is of small diameter and the gas velocity maintained high. If the gas velocity is not high enough a higher temperature must be maintained, a temperature of 450 deg. being needed at atmospheric pressure to maintain a dry gas from kerosene.

80,000 Aviators Available for Air Fleet

Senate Investigating Committee Reveals Delay of 2 Months in Program by Changes in Design and Drafting of Skilled Workers Into National Army

Eighty thousand aviators, trained or nearly trained, are available now for the American aviation fleet.

America's airplane program, which will cost $1,000,000 in addition to the $640,000,000 already expended, has been delayed two months because of necessary changes in the type of combat machines, due to the altering of plans to meet the ever changing German tactics.

Delay has also been caused by the drafting of thousands of skilled toolmakers into the National army.

Inability to secure adequate supplies of spruce for the manufacture of planes has been caused by unwillingness on the part of the great lumber concerns to cut sufficient timber to produce the kind of spruce needed, and also by failure to place an official in the lumber districts with full authority.

These were the more important developments of the open sessions of the hearing of airplane activity by the Senate Military Affairs Committee this week. The first hearings Monday, Tuesday and Wednesday were in executive session, and no details were made public. On Thursday and Friday sessions were open to the press, and discussions by Col. E. A. Deeds, Col. Montgomery, Major Charles R. Sligh and ex-Governor Oswald West of Oregon were heard.

Following the opening sessions Howard E. Coffin, chairman of the Aircraft Production Board, was again recalled by the committee which, at his request, placed to-day's hearing in executive session, maintaining secrecy about the developments.

Baker's Brother Lost Contracts

At the hearing on Thursday it developed that H. D. Baker, a brother of the Secretary of War, had been interested in an airplane factory at Niles, Ohio, which had, but lost, contracts with the Government.

Before this matter had been gone into deeply it was learned that as soon as the Secretary of War knew of the contract he ordered it cancelled. Col. Deeds, assistant to Gen. Squier, Chief Signal Officer, testified that H. D. Baker had conferred with him last June about securing a contract, but had been turned down because the plant was not ready to produce.

Later, when the plant was equipped, and known as the Engel Aircraft Co., it was given contracts which Secretary Baker cancelled soon after. With regard to this matter Secretary Baker issued a statement explaining that although the men interested in the company were of the highest standing, he directed that the contract be cancelled to avoid possibility of embarrassment. H. D. Baker also withdrew from the company.

Col. E. A. Deeds, in his testimony, said that it had been necessary to change the entire program at least twice because of developments in Europe, where the second battle of Verdun showed that a change of type was necessary.

The life of a battle plane used at the front seems, from the Verdun experiences, to be about two months, after which it is worn out and must be replaced with a new machine.

He said that the proposal to appropriate a billion dollars for the new airplane program is not an over-estimate of the needs of the service, and that this amount will be necessary for the program recommended by Gen. Pershing, and adopted by the War Department.

Col. Deeds stated that it has frequently been found difficult to secure materials even when priority orders are granted, and in reply to inquiry he said that when all branches of the Government are seeking priority orders confusion results.

He believes the time is coming when it will be necessary to seek priority over priorities in order to get the immediate necessities.

Probe Spruce Shortage

Major Charles R. Sligh, who was removed from the Aircraft Production Board, where he had charge of wood production, was one of the chief witnesses at the open sessions. Col. R. L. Montgomery, Chief of the Equipment Division of the Signal Corps, stated that Major Sligh was removed because heads of the service believed spruce production was delayed. Major Sligh stated that he was too accurate to satisfy the members of the Lumber Committee of the Council of National Defense, and he went into great detail to explain political angles and jealousies and also to make statements about the unwillingness of the larger lumber companies to co-operate with him.

He stated that the Weyerhauser lumber interests had a representative on the Lumber Board with whom he did not agree, and that the Weyerhauser company, although it had the requisite amount of spruce needed by the Government, refused to cut the timber because it would create a surplus of lumber and thereby cheapen the price.

He spoke disparagingly of Col. E. R. Disque, head of the new Spruce Production Committee, and stated that since Col. Disque was in charge spruce production had fallen from 4,000,000 feet per month to 2,000,000 feet per month.

He said that there was no system to the present spruce purchasing of the Aircraft Board, and recommended centralized buying and standardized grades. He stated that by the use of standardized grades, and particularly by using what he termed "Specification No. 1 Spruce," it would be possible to get 30 per cent instead of the present 15 per cent out of the logs.

He claimed that the Curtiss Aeroplane Co. was using about 465 feet of spruce to a plane now, following his recommendation for the use of "Specification No. 1 Spruce," as compared with 1000 feet to a machine prior to that time.

According to Major Sligh, England and France are using 2440 feet of spruce to the machine, and Italy is using only slightly less. Major Sligh stated that before he inaugurated the present purchasing system the Government was paying $200 per 1000 feet for inferior spruce, and that at this time, through his plan, it secures a superior grade for $105 per 1000 feet.

Cost of Airplane Spruce

He eliminated the brokers and dealt directly with the mills. He showed that only a short time ago airplane companies were paying a minimum of $140 per plane for spruce, and using an average of 1000 feet per plane, which is now reduced to an average of 600 feet. Major Sligh stated that the production of spruce was 2,000,000 feet in September, which he increased to 4,000,000 feet in November. Col. Disque, he said, took charge in October, and production decreased to 2,500,000 feet in December and 2,000,000 in January. He admitted that part of this decrease was due to the rainy season, but thought that the three thousand workers recently sent to the lumber districts by the Government should have offset the effects of the rain.

Major Sligh stated that 80,000,000 feet of spruce would be required to meet the plane-building plans for 1918.

Ex-Governor West told the committee that only 20 per cent of the required spruce was being obtained. He said that someone with authority and with experienced lumbermen as advisers was necessary as head of the Government lumber interests in the West. The aviation program, according to Mr. West, called for 11,000,000 feet of spruce a month, while in the past six months ended Dec. 31 only 13,500,000 feet had been produced.

Details regarding the engineering progress of the Liberty engine, and the changes of type and various tests, were all told in executive sessions, and none of this information was made public.

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Airplane Spruce Supply Within 50 Per Cent of Requirement

WASHINGTON, Feb. 5—Howard E. Coffin, in conference to-day, stated that while the spruce supply for airplanes was not up to schedule, it was not as far behind as was stated last week in the Senate Committee hearings. He believes the supply is now within 50 per cent of the requirements, and will soon be increased to meet the demand.

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Hardy & Co. Assign French Rights

COVENTRY, ENG., Jan. 25—Ed. J. Hardy & Co., makers of the Hardy flexible joint, have assigned the French rights to this joint to Messrs. Brampton Bros., Calais, France, makers of Brampton chains.

Chevrolet Car Sales Double in 1917

125,004 Sold for $62,638,303—General Motors Profits Greatly Increased

DETROIT, Feb. 2—Sales of the Chevrolet Motor Co. in 1917 amounted to $62,638,303 for 125,004 cars as against $32,306,295 for 62,522 cars sold the year before. This represents an increase of 99.8 per cent in the number of cars sold, and 93.9 per cent in the cash value.

These figures were given out in the preliminary report of the General Motors Co. The same report shows undivided profits for that company for the 5 months ended Dec. 31 of $15,000,000 compared with $11,238,984 in the corresponding period of 1916. This is figured before the deduction of war taxes. Results for the 5 months of 1917 and 1916 follow:

	1917	1916	Increase
Cars and trucks sold	89,901	65,893	21,008
Net sales	$94,500,000	$60,731,130	$33,768,870
Undivided profits	15,000,000	11,238,904	3,761,016

Ford Building for Drafting and Designing

WASHINGTON, Feb. 4—The Ford Building here will not be occupied by the Quartermaster Corps, as was first planned, but will instead be taken over by the drafting and designing branch of the Ordnance Department.

Will Map Truck Routes

WASHINGTON, Feb. 5—The pathfinder car of the Highways Transport Committee of the Council of National Defense starts this week mapping out army truck routes for the Government. The committee has already laid out an official route from Detroit to the seaboard and another from Buffalo to the seaboard; it is now proposed to tap every truck manufacturing point in the central west and pick out feeder lines to two great main highways running eastward.

The pathfinder will go as far west as the Mississippi river and will map routes from cities in Wisconsin, Illinois, Michigan, Indiana and Ohio. The car will be in charge of Raymond Beck, field engineer of the Highways Transport Committee; with the car will be Major W. D. Uhler, formerly State Highway Engineer of Pennsylvania and now connected with the Motor Transport Service of the Quartermaster's Department, and Captain E. B. Butchers, Brigade Engineer of the U. S. Engineers' Corps.

As each state line is reached a representative of the State Highway Department will join the car and proceed over the roads of his own state. When this trip is completed the Government will have four main highways forming connecting links between the great manufacturing centers of the country and the Atlantic seaboard.

Motor transports on their way to France will follow these routes and will carry cargoes to relieve freight congestion. The drivers will secure their training under service conditions and be better fitted for their tasks of driving when they reach the war zone.

Minneapolis Show Biggest of Year

MINNEAPOLIS, Feb. 4—The Twin City show, which opened to-day, is a real automotive show, and is bigger than the New York and Chicago exhibitions put together. On the opening day the crowds were so enormous that the box office facilities broke down, and the association officers had to take admission fees at the gate, and pass the people in without tickets.

The show is held in the Overland Building and there are nearly three miles of aisles. The exhibits are varied, and include not only passenger cars, but trucks, tractors and accessories for all three. Farm lighting and farm power machinery, as well as household appliances are shown. There is also one airplane on exhibit, and a big industrial section, including Red Cross and food administration booths. It is nearly a quarter of a mile around the building and the crowds make traveling slow.

One Sub-Chaser a Day from Ford

Highly Standardized Boats to Be 200 Feet Long—500 Tons Displacement

WASHINGTON, Feb. 5—The Ford Motor Co. is to manufacture submarine chasers at the rate of a completed boat a day. Word to this effect and additional information that the first vessel has already been started has been made public.

As is to be the case with the 150-foot vessels to be manufactured by the Elco Works, Bayonne, the brief description of which was given in AUTOMOTIVE INDUSTRIES last week, these sub-chasers which Ford will build are to be highly standardized products. They are to be 200 feet long and of 500-ton displacement. The boats will be fabricated largely of structural steel shapes by the progressive assembly method in Detroit and taken to the sea by way of canals and inland waterways. Power will be furnished by geared steam turbines. There will be nothing freakish about the boats or their equipment. The number of boats ordered has not been revealed.

Probe Airplane Plans in Senate

(*Continued from page* 334)

there is no industry which can be definitely called non-essential.

Interesting news dispatches of the last few days told that the Ford Motor Co. will construct U-boat chasers for the United States. The Ford method of building automobiles on the progressive assembly plan will be followed in the construction of the new boats, which Mr. Ford is said to have designed himself for the Navy. The fabricated parts of the boats will be assembled in sections.

It is planned to have the hull, corresponding to the frame of the motor car, move on a conveyor from department to department, gradually being completed and made ready for launching. The Ford U-boat destroyers will be launched on the Great Lakes and brought to the coast under their own power.

A misunderstanding at the Navy Department last week cost Mr. Ford some good publicity. Seeing the story of his new contract with the Navy in the morning papers he wired to the department for permission to give out in Detroit a complete story of his plans. In the absence of Secretary Daniels, Assistant Secretary Roosevelt, unaware that Secretary Daniels himself had given out the short news item, denied the permission.

The War Industries Board of the Council of National Defense, which controls the important divisions known as the Steel Products Section, Automotive Products Section, etc., faces either abolition or readjustment and modification, as a result of a reorganization in the War Department.

The work of the board is already curtailed by the appointment of Col. Palmer Pierce, as Director of Purchases, and E. R. Stettinius as Surveyor General of Supplies in the War Department. These appointments effect principally the purchasing, but leave the work of stimulating and directing production still to the War Industries Board.

Standardized Equipment Important

An interesting point in the standardization of trucks developed at the hearing of Secretary Newton D. Baker at the Senate Committee meeting last week, when Senator Weeks questioned Secretary Baker as to our motor transportation progress, and the secretary answered the accusation of procrastination by stating that "motor transportation is short in the American camps in Europe now for the reason that the production of standardized and interchangeable equipment is of the very greatest importance."

He also added that our standardized trucks are in quantity production now. And in reply to inquiry as to why many divisions were not temporarily with any standard make of trucks, he said, "Now the requirement is that every division should have standard equipment in operation. Instead of buying promiscuous and indiscriminate truck and motor equipment which would have to be discarded when the division actually went into operation, the plan is to supply them with standardized equipment when they need it."

Shortage of Gas Ties Up Detroit

Between 8000 and 10,000 Men Laid Off—Some Plants Are Entirely Closed

DETROIT, Feb. 3—Between 8000 and 10,000 men had to be laid off temporarily Saturday by a score of manufacturing concerns engaged in war work, owing to a shortage of gas. Conditions are so acute that unless the gas company receives the needed coal within the next 36 hours 100,000 or more workers will be compelled to remain idle, as nearly all the local plants will be short of gas by Monday night. Gas company officials, the fuel administration and the railroads are co-operating to bring relief as quickly as possible, but the situation is considered very serious by all.

This is best shown by the action some of the biggest plants here found it necessary to take, notwithstanding that they are doing war work and thus are entitled to preferential service in getting the supplies of coal, oil, etc.

At the Ford Motor Co. about 4000 men were laid off Saturday and 4000 more may be turned home again Monday unless sufficient gas is available.

Several hundred men were laid off by the Michigan Stamping Co. owing to the shortage of gas, and the amount of coal on hand will only last 4 days at the most.

At the Northway plant more than 100 men were laid off, and the information was given that the plant might have to be closed Monday.

The enameling and block test departments of the Hudson Motor Car Co. are said to have been closed and other departments may have to be shut down within the next 48 hours unless gas is obtained.

The Detroit Forging Co., the Detroit Vapor Stove Co., the McCord Mfg. Co., the Detroit Automobile Supply Co., and several others engaged in war work have closed all departments using gas.

These are merely a few of the most important concerns partly or entirely closed, but it is likely that there will be scores unable to continue operations next week unless gas and coal are available.

The coal situation is practically as acute as it was a week ago. The continual inclement weather has nullified efforts made to get coal to the city. Coal dealers and railroad men say that the men are willing to do their utmost to relieve the situation, but the severe weather is rendering outdoor work almost impossible.

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Detroit Used Car Show a Success

DETROIT, Feb. 4—The used passenger car and truck show, promoted by the Detroit Automobile Dealers' Assn., and held in the Overland Building, is reported by the exhibitors to be a success. The show opened Feb. 2 and will continue all week. According to the management, there were more than 2000 visitors the first day, and many cars were disposed of. Practically every dealer in Detroit has space, and there are about 300 cars and trucks on exhibition. Admission to the show is free, and tickets are obtainable at all dealers and accessory stores, hotels and newspaper stands.

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Renfro Edmunds & Jones Distributer

NEW YORK, Feb. 7—John F. Renfro, 1834 Broadway, New York, has been made eastern distributer for the Edmunds & Jones Corp., Detroit. The company makes equipment for Ford and Dodge Brothers cars, and Renfro will have charge of repairs and parts sales in connection with this work.

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No Plain Lenses for Missouri Cars

ST. LOUIS, Feb. 4—The new state law which prohibits plain lenses on motor car lights became effective Feb. 1 and accessory stores had the most rushing week of their existence. There was a wild skirmish among car owners to find a market for the discarded plain lens but no outlet appeared and thousands of them went into the scrap heaps.

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Oetting to Address Cleveland S. A. E.

CLEVELAND, Feb. 4—At the coming meeting of the Cleveland Section of the Society of Automotive Engineers to be held Feb. 15, O. W. A. Oetting, special engineer of the Willard Storage Battery Co., will give a paper entitled, "The Effects of Low Temperatures on Starting." The place of the meeting will be announced later.

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Lane Heads Parker Rust-Proof

DETROIT, Feb. 6—C. W. Parker, president and founder of the Parker Rust-Proof Co. of America, has resigned as president but retains his seat on the board of directors. George F. Lane, formerly general manager, has been elected president, and a new board of directors consisting of eleven men instead of seven has been chosen. The new officers are: President, George F. Lane; vice-president, Joseph G. Johnson; secretary-treasurer, W. M. Cornelius. Directors include the officers and George D. Mason, William H. Beamer, Thomas Bronley, Jr., Harry Spere, C. W. Parker, E. J. Corbett, F. M. Beal and Fred M. Aldrich. An engineering office will be opened in Detroit.

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Fire Visits Belle City Iron

RACINE, WIS., Feb. 4—Fire of unknown origin almost totally destroyed the main shop of the Belle City Malleable Iron Co., Racine, Wis., causing a loss of at least $100,000. The foundry proper was saved. The burned building was two stories high, 80 by 120 ft. in size, and contained the pattern shop and storage vaults, core room, machine shop and stock room. Reconstruction work will begin immediately.

Priority Regulations Broadened

New Class, for War Emergency Work, Added—List of Products Lengthened

WASHINGTON, Feb. 6 — Priority Order No. 3, which was issued Sept. 21 by Judge Robert S. Lovett of the Priority Board, has been slightly modified by Priority Circular No. 3 which has just been issued.

The circular defines the regulations of the previous order and makes it apply to all individual firms, associations and corporations engaged in the production of copper, iron and steel and in the manufacture of their products: of chemicals, cotton duck and woolen cloth, and all such other raw materials and manufactured products as the committee may deem necessary from time to time.

The original priority order applied only to the production of iron and steel and in the manufacture of their products.

Under the new regulations all orders and work are divided into four general classes, instead of three as heretofore. These four are:

Class for Emergency Work

Class AA, which is the new classification and which covers "only emergency war work of a special or urgent nature"; Class A, which covers other war work necessary to carry on the war, such as arms, ammunition, destroyers, submarines, airplanes, locomotives, etc.; Class B, which covers orders and work which, while primarily designed for the prosecution of the war, yet are of public interest and essential to the national welfare or otherwise of special importance; Class C covers all orders and work not covered in the other three classifications.

The new regulations do not change any priority orders previously issued. The rule of procedure from now on is that orders and work in Class AA shall take precedence over those in all other classes; orders and work in Class A precede those in Class B, and these in turn precede those in Class C. The circular states:

Priority Rules Explained

"The classification of an order simply means that it shall be given precedence over orders of a lower classification as may be necessary (and only such as may be necessary) to insure delivery on the date specified in the order. It does not mean that work should cease on orders of a lower specification or that the order should be completed and delivery made in advance of orders taking a lower specification if this is not necessary to effect delivery within the date specified. The one to whom a priority certificate is directed should make his own production plans so as to get the maximum of efficiency out of his operations, making all deliveries at the times contracted for, if possible, and where this is not possible, giving precedence to the orders taking the highest classification."

Fuel Situation Near Crisis

Detroit Plants Closing — Gas Company Has 2 Weeks Supply—Shutdown Feared

DETROIT, Feb. 5—The fuel situation is becoming more critical every day. The Maxwell, Paige, Chalmers and Studebaker factories will have to close to-day unless a supply of coal arrives. The Lincoln Motor Co., which is making Liberty engines, has enough coal to last 7 days; the Ford Motor Co. enough for 13 days, and the Packard Motor Car Co. has a 10 days' supply. Many homes in Detroit are without fuel and the weather is below zero.

The gas company has coal for only a few weeks. If no relief comes before that time every engine testing department, enameling oven and all other work depending on gas will have to be stopped.

The confiscation by the local fuel administration yesterday of 20 cars of gas oil and several cars of coal, consigned to industrial plants here and the diversion of them to the gas company's plant, has only slightly relieved the situation. According to H. P. Hood, in charge of the industrial department of the Detroit City Gas Co., the general situation is still very acute and it is more than likely that most of the gas-using departments of the local plants will remain closed for the next few days. The railroad companies are making a special effort to get a supply of gas tanks and coal to the city, and all the local oil companies are co-operating in this respect.

At the General Aluminum & Brass Co., if the gas supply should be cut off for 3 hours, the entire plant will probably have to be closed down.

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DETROIT, Feb. 6—The fuel situation throughout Michigan is daily assuming more serious proportions. Many of the larger companies, including Packard, Paige, Studebaker, and a number of others engaged in important war work and employing thousands of men are living from day to day and borrowing fuel to keep from shutting down. None of these plants has more than 10 days' supply. The situation is so serious that schools are closing to-day for a two-week period. A contributory reason for the coal shortage is that the miners at Albion are on strike, tying up mines which supply 2,000,000 tons annually. Small towns throughout Michigan are appealing for help. In this city the supply of coal at the local gas company remains low, 1000 cars of coal consigned to Michigan being tied up in Toledo. It is expected that 600 of these cars will remain here.

—

22,000 Trucks for Ordnance

WASHINGTON, Feb. 5—The Ordnance Department is figuring on purchasing 22,000 Four-Wheel Drive and Nash trucks. It is likely the contracts will be let within the next three weeks.

—

Stimulate After-War Exports

WASHINGTON, Feb. 6—By way of facilitating and stimulating after-the-war export business, the War Trade Board has issued instructions explaining to exporters the method of using form X which supersedes all others and which must be filed for all shipments abroad.

Scope of War Board Outlined

Motorcycles, Cars, Trucks, Tractors, Gas Engines and Accessories Controlled

WASHINGTON, Feb. 7—By way of eliminating any confusion which may have existed concerning the activities of the Automotive Products Section of the War Industries Board, this section has made public a chart which reveals its many activities and responsibilities. The chart follows:

H. L. Horning (formerly Waukesha Motor Co.).

Coker F. Clarkson (formerly general manager S. A. E.).

A. B. Brown (Rochester, N. Y.).

George Adams (formerly Garford Motor Truck Co.).

MOTORCYCLES.

Motorcycles.
Motorcycle sidecars.

MOTOR CARS.

Motor cars.

MOTOR TRUCKS.

Motor ambulances.
Motor trucks.
Motor truck bodies.
Motor truck tractors.
Motor truck trailers.
Armored cars.

TRACTORS.

Military tractors.
Military tanks.

GAS ENGINES.

Aeroplane engines.
Marine gas engines.
Stationary gas engines.

ACCESSORIES.

Automotive accessories.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	46	55	+3
*J. I. Case T. M. Co. pfd.	77	81	+1
Chalmers Motor Co. com.	3	5	—1
Chalmers Motor Co. pfd.	25	40	—10
*Chandler Motor Co.	82	83	+9½
Chevrolet Motor Co.	119	121	+9
*Fisher Body Corp. com.	26	35	+1
*Fisher Body Corp. pfd.	80	87	— ½
Fisk Rubber Co. com.	49	51	..
Fisk Rubber Co. 1st pfd.	98	103	..
Fisk Rubber Co. 2nd pfd.	60	70	..
Firestone Tire & Rubber Co. com.	95	98	+ ½
Firestone Tire & Rubber Co. pfd.	95	97	..
*General Motors Co. com.	134½	136½	+18½
*General Motors Co. pfd.	85	89	—9
*B. F. Goodrich Co. com.	47	49	+5
*B. F. Goodrich Co. pfd.	97	100	+2
Goodyear Tire & Rubber Co. com.	132	136	—1
Goodyear Tire & Rubber Co. pfd.	97	100	+2
Grant Motor Car Corp.	2	3	..
Hupp Motor Car Corp. com.	2¾	3	..
Hupp Motor Car Corp. pfd.	75	80	..
International Motor Co. com.	14	17	..
International Motor Co. 1st pfd.	40	45	..
International Motor Co. 2nd pfd.	14	17	—6
*Kelly-Springfield Tire Co. com.	46	47	+3½
*Kelly-Springfield Tire Co. 1st pfd.	75	80½	+1½
*Lee Rubber & Tire Corp.	14	15	+1
*Maxwell Motor Co., Inc., com.	28	29	+2
*Maxwell Motor Co., Inc., 1st pfd.	60	61	+2½
*Maxwell Motor Co., Inc., 2nd pfd.	22	23	+1
Miller Rubber Co. com.	129	134	..
Miller Rubber Co. pfd.	95	96	..
Packard Motor Car Co. com.	85	90	—2
Packard Motor Car Co. pfd.	91	94	..
Paige-Detroit Motor Car Co.	16	18	+1
Peerless Truck & Motor Corp.	16	17	..
Portage Rubber Co. com.	108	112	—2
Regal Motor Car Co. pfd.	..	23	..
†Reo Motor Car Co.	16	18	..
*Saxon Motor Car Corp.	9½	11	+2
Springfield Body Corp. com.	..	..	..
Springfield Body Corp. pfd.	..	..	..
Standard Motor Construction Co.	9	11	+1½
Standard Parts Co.	72	80	+5
*Stewart-Warner Speed. Corp.	51	52	+1
*Studebaker Corp. com.	53	54	+3
*Studebaker Corp. pfd.	91½	97	+2
Swinehart Tire & Rubber Co.	35	40	..
United Motors Corp.	25	25¼	+ ¾
*U. S. Rubber Co. com.	57	58	+1
*U. S. Rubber Co. pfd.	98	101	+4
*White Motor Co.	41	42	+3
*Willys-Overland Co. com.	18¼	19	+1½
*Willys-Overland Co. pfd.	78	79½	+2½

*At close Feb. 2, 1918. Listed New York Stock Exchange.
†Par $10.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS	Bid	Asked	Net Ch'ge
Auto Body Co.	..	8¼	..
Bower Roller Bearing Co.	17	..	—2⅜
Chevrolet Motor Co.	117	122	+12
Commerce Motor Car Co.	6	..	+2
Continental Motor Co. com.	5⅝	5¾	+ ⅛
Continental Motor Co. (new)	85	..	..
Edmunds & Jones com.	..	..	..
Edmunds & Jones pfd.	..	..	..
Ford Motor Co. of Canada	187	191	+17
Hall Lamp Co.	13¾	14¾	..
Michigan Stamping Co. com.	12½	13	— ⅜
Motor Products	..	..	..
Packard Motor Car Co. com.	82¼	..	—3¾
Packard Motor Car Co. pfd.	91½	92½	+ ½
Paige-Detroit Motor Car Co.	18¼	18¾	+3
Prudden Wheel Co.	15	16¼	+ ¼
Reo Motor Car Co.	17	17⅜	+ ⅜
INACTIVE STOCKS			
Atlas Drop Forge.	..	32	..
Kelsey Wheel Co.	81	88½	..
Regal Motor Car Co.	..	26½	..

Chart for Specification Tests on Class B Military Trucks

INSPECTION REPORT
— OF —
STANDARDIZED MILITARY TRUCK

*Class*_____ *Serial No.*_____

MANUFACTURED BY..... AT.....
INSPECTED BY..... Q. M.....
ACCEPTED BY..... Q. M.....

REC'D O. Q. M. G. MOTOR TRANSPORT..... 19....
APPROVED BY..... Q. M.....

FOR SHIPMENT BY RAIL.

Before shipment the radiator and gasoline tank were drained and a conspicuous tag was hung on the steering wheel stating the necessary steps to be taken before starting the engine.

Important parts liable to injury by tampering were sealed.

List of seals as follows:.....
.....
.....

Loose parts liable to theft were secured by boxing.

All parts subject to corrosion were properly protected.

Chassis was shipped.....
.....
Signed.....Q. M.....

FOR OVERLAND DELIVERY.

Chassis complete with all spare parts and accessories delivered
to .....
at .....
Signed.....Q. M.....

REMARKS: .....
.....
.....

WASHINGTON, Feb. 4.—Shown herewith is the standardized test chart which has been prepared by the United States Government for use in checking the specifications and assembly of the Class B military trucks. Some idea of the thoroughness of the checking may be gained by the minute scrutiny which must be given every part before the truck is finally turned over to the Government as being O. K.

In the production of these trucks the Government deals directly with the makers of the various parts, supplying the parts to the assemblers. In the case of the Class A and Class AA trucks, the Government will deal with the assemblers, who in turn will deal with the parts makers.

....., 19.....

TO THE QUARTERMASTER GENERAL, U. S. ARMY,
WASHINGTON, D. C.

1. I have carefully inspected the above numbered truck chassis and have found it to be in accordance with specifications.

2. I have passed same as efficient for service.

Motor No.....	Frame No.....
Generator No.....	Front Axle No.....
Magneto No.....	Rear Axle No.....
Distributor No.....	Radiator No.....
Carburetor No.....	Wheel Nos. { Wood F...R... / Steel F...R...
Steering Gear No.....	Tires .....
Clutch No.....	Springs .....
Transmission No.....	
Univ. Joints, Front.....	
Univ. Joints, Rear.....	

Motor Operation	Muffler .....
Compression	Gas Tank .....
Tappet Clearances	Gas Lines .....
Ignition	Reach Rod .....
Carburetion	Bumpers .....
Water Leaks	Starting Crank .....
Oil Leaks	Sprag .....
Governor Action	Hood .....
Governor Setting	Rear Axle .....
Timing	Oil Supply Motor .....
Acceleration	Oil Supply Transmission.....
Oil Pressure	Oil Supply Rear Axle.....
Fan	All Lubricated Parts.....
Hand Control	Upholstery .....
Steering Gear	Cotter Pins .....
Clutch Adjustment	Lock Washers .....
Transmission	Rattles .....
Lighting System	Painting .....
Foot Brakes	Standard Tools .....
Emergency Brakes	Special Tools .....
Wheels	

N. Y. Exports Drop 28 Per Cent

Truck Shipments for December Fall Off 50 Per Cent—Allies Buy Most

NEW YORK, Jan. 31—Exports of passenger cars, trucks and parts from this port during December amounted to $6,955,818, which is only 72 per cent of November exports. Most of the decrease, however, was due to the falling-off in the number of trucks shipped to the allies. In November, England alone received 971 trucks, whereas the total number shipped to all countries during December was 427. The total value of 2907 passenger cars shipped was $3,624,118, that of the 427 trucks was $1,046,687, and exports of parts amounted to $2,285,013.

Australia was the largest purchaser of passenger cars, with a bill of $296,718 for 297 cars, and Argentina came second with receipts of 265 cars valued at $212,815. In November, Russia bought the largest number of cars, but not a single one was shipped to her during December.

France bought 118 trucks, costing $540,520. England came next, with 101 valued at $287,300. Chile's purchases of trucks exceeded England's in number, but were of a cheaper grade, and the bill amounted to only $86,606.

Shipments to the allies amounted to 1/3 of the total, those to South America amounted to ¼ and those to England's colonies amounted to about 1/5.

—

May Prohibit Chrome Imports

WASHINGTON, Feb. 5—Chrome ore may soon be prohibited as a product to be imported in this country, or its importation may be largely reduced. The import trade in manganese and nitrates requires a large tonnage, which the Government needs for exportation of supplies to Europe, and in consequence the United States aims to reduce this tonnage and use the American bottoms engaged chiefly in imported chrome ore in the war zone service. This will probably seriously affect some of our large steel plants which are depending on Cuba and other points outside of the United States for ore, and in turn display its effect upon the industry's steel allowance.

—

KENT, OHIO, Feb. 2—Sales of the Mason Tire & Rubber Co. for the three months ending Jan. 31, 1918, show an increase of 700 per cent over the corresponding period a year ago. January sales were the largest in the history of the company for any one month.

Automobile, Truck and Parts Exports from New York for November

Country	Cars (No.)	Value	Trucks (No.)	Value	Parts
Argentine	265	$212,815	4	$6,939	430,336
Australia	297	296,718	...	....	288,978
Barbados	13	6,541	...	....	2,113
Bolivia	2	6,959	...	....	5,725
Brazil	197	132,531	5	2,125	24,961
British East Africa	....	....	...	....	2,182
British Guiana	10	8,321	...	....	3,993
British Indies	....	....	...	....	49,544
British South Africa	97	170,944	3	12,399	119,447
British West Africa	34	23,052	1	1,357	11,605
British West Indies	6	2,593	9	6,810	7,375
Canary Islands	....	....	...	....	340
Chile	199	593,364	112	86,606	....
Colombia	6	6,285	...	....	2,557
Costa Rica	32	13,600	2	5,500	19,146
Cuba	246	186,750	22	50,318	77,365
Danish West Indies	1	800	...	....	214
Dutch East Indies	43	32,038	...	....	11,1[illegible]
Dutch Guiana	1	841	...	....	9
Dutch West Indies	2	1,841	...	....	758
Ecuador	10	7,939	...	....	2,703
England	3	7,500	101	287,300	662,972
France	199	249,868	118	540,520	530,401
French Africa	51	17,789	16	8,363	3,878
French West Indies	29	24,499	...	....	4,611
French Guiana	....	....	...	....	2,358
Greece	4	5,265	...	....	4,903
Guatemala	....	....	...	....	3,105
Haiti	8	4,378	2	1,179	5,037
Honduras	5	3,052	...	....	2,236
Italy	....	....	...	....	8,926
Jamaica	29	20,544	...	....	3,781
Liberia	8	2,745	...	....	....
Mexico	82	73,137	6	10,544	2,953
Morocco	16	6,570	...	....	....
Newfoundland	1	711	...	....	140
New Zealand	9	8,986	3	3,300	13,257
Nicaragua	4	3,061	...	....	258
Norway	....	....	2	4,308	....
Paraguay	12	4,380	...	....	....
Panama	5	3,226	...	....	9,068
Peru	144	195,975	3	7,129	11,078
P. I.	....	....	14	18,000	921
Port Af.	....	....	...	....	503
Salvador	....	....	...	....	352
Santo Domingo	23	14,029	1	1,400	6,233
Scotland	25	87,000	...	....	375
Siam	....	....	...	....	405
Spain	115	131,564	3	3,662	18,623
Switzerland	3	1,553	...	....	....
Trinidad	66	10,201	2	2,350	5,928
Uruguay	65	102,663	3	4,297	21,362
Venezuela	7	4,263	2	4,950	4,196
Total	2,907	$3,624,118	427	$1,046,687	2,285,013

N. A. C. C. Appoints Truck Committee

Will Help in Solving Freight Problems—Result of Truck Makers' Convention

WASHINGTON, Feb. 5—With a view to aiding the Government in breaking the present nation-wide freight congestion, the National Automobile Chamber of Commerce has just appointed a Motor Truck Committee for constant service in Washington. This committee was appointed as a result of the recent convention of motor truck manufacturers held in New York, Jan. 8, 1918.

At this gathering, which voiced the unanimous desire of the nation's motor truck manufacturers to co-operate with entire unselfishness in any Government measures, three men very closely allied with war activities pointed out the need for a motor truck committee.

These men were Christian Girl, Director of Production, Military Truck Division, Quartermaster Corps., U. S. A.; Hugh Chalmers, Automobile Industries Committee, and Roy D. Chapin, Chairman, Highways Transport Committee.

It was explained that the importance of the motor truck was constantly increasing, not only as a war factor, but as an immediately available medium dealing with the freight congestion.

The committee as organized recently includes George M. Graham, Pierce-Arrow Motor Car Co., chairman; Windsor T. White, president, White Co.; M. L. Pulcher, general manager, Federal Motor Truck Co.; David Ludlum, president, Autocar Co.; D. C. Fenner, Mack Motor Truck Co.

This committee will work largely with the Highways Transport Committee. This latter committee, of which Roy D. Chapin is chairman, has charge of the task of diverting traffic from railroads to the highways in order to restore normal distribution.

Through its direct touch with the motor truck industry and with shippers all over the United States, the Motor Truck Committee should be in a position to lend signal aid.

The committee will also be available to all other departments of the Council of National Defense or of the War Department for any service it may be able to render. It will also render to the manufacturers of motor trucks all over the United States such assistance as they may call for.

Temporary headquarters have been taken in the Ouray Building, Eighth and G Streets, N. W., Washington, D. C.

—

Grossman Not Affected by Bush Terminal Change

BROOKLYN, Feb. 6—The Emil Grossman Mfg. Co., located in the Bush Terminal Building, which was taken over by the Government, will not be affected, since the Government will use only the docks and warehouse part of the building.

Industrial Review of the Week

A Summary of Major Developments in Other Fields

Steel Industry Operating at Only 50% Efficiency

The steel industry of the country, according to the best data obtainable, is operating on a 50 per cent basis, and some plants at no more than 25 per cent. No decided improvement is to be expected for several weeks, so serious is the derangement of every part of the machinery of transportation both in raw and finished materials. Producers will be many days working out of the glut of their own output which now prevents any measurable increase in rolling mill operations. At some plants the situation is simply chaotic.

The pig-iron statistics for January give a measure of what the steel industry has suffered from the unparalleled weather and transportation conditions of the past month. Output fell to 2,411,768 tons, or 77,799 tons a day, against 2,882,918 tons in December, or 92,997 tons a day. January production was thus the smallest since May, 1915.

On Feb. 1 the number of active furnaces was 310, while on Jan. 1 it was 321 and on Dec. 1, 345. How repeated bankings have crippled operations appears from the fact that in May, 1915, only 200 furnaces were at work to produce 73,015 tons a day, whereas last month it took an average of 315 furnaces to produce 77,799 tons a day.

To-day's situation is much more discouraging than the January figures show. Severe cold suddenly swept down this week on the Middle West, the heart of the iron and steel producing section of the country, and for the first six days of February pig iron production has probably been at less than 50 per cent of capacity. In January it was at the yearly rate of 28,700,000 tons, while the total for 1917 was about 38,600,000 tons. To-day the rate is probably under 22,000,000 tons a year.

Costs have advanced prodigiously under the cumulative handicaps in every part of the industry, and the showing in this respect when iron and steel prices are officially considered in March will argue even more strongly against downward revision than the cost figures canvassed at Washington in December. Predictions of smaller pig iron and steel production in 1918 than in 1917 have already appeared.

A development affecting the business of export houses is causing them some concern. Foreign purchases not for Government account have been unrestricted as to price, but they have been hard to place owing to scarcity of vessel space. Now, apparently at the suggestion of Washington, considerable general French and possibly British buying may be put through as defense material by the foreign commissions at the capital. While bottoms may thus be insured, the so-called Government prices will undoubtedly obtain. Steel and equipment for a French railroad may be placed in this way.—*Iron Age.*

A New Service

¶ Herewith AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

Mercer Bucks Snow In Overland Drive

CHICAGO, Feb. 1—Possibilities of delivering cars by road from factories on the Atlantic coast to points in the middle west, even in midwinter, were demonstrated last week by E. W. Schillo, Chicago Mercer dealer, when he completed a trip from the factory at Trenton, N. J., with the first of his 1918 allotment. His purpose was the dual one of saving a freight car for shipping Government supplies and also to give the car a thorough chassis test on the road. Almost the entire trip was made in deep snow and on portions of the road his car was the first vehicle which had traveled it for days. Schillo plans to drive the most of his allotment from Trenton to Chicago this season. The trip was started from the Mercer factories Jan. 15 in one of the standard roadsters and was finished Jan. 23.

—

Car Dealer to Sell Airplanes

CHICAGO, Feb. 4—Harry Newman, Maxwell and Chalmers distributer, has arranged to supply his customers with aircraft as well as roadcraft, and is the first motor car dealer to handle aircraft on a commercial basis. He is showing a plane of tractor type, but he cannot promise delivery until after the war.

—

Mutual Motors Plant to Be Auctioned

DETROIT, Feb. 6—The plant of the Mutual Motors Co., which formerly manufactured the Marion-Handley car, will be sold at public auction to-morrow in Jackson, Mich. The assets of the bankrupt concern are inventoried at $1,300,000. It is expected that the Jackson Munitions Corp. will be one of the bidders for the plant.

Coal Situation Acute Despite Shut-Down Orders

The cold wave which descended upon the country the first part of the week greatly interfered with railroad transportation and undid in large measure the good work which had been accomplished up to that time.

Throughout New England the fuel situation is acute, both as regards manufacturing and domestic consumption. A short temporary priority order secured at Hampton Roads in favor of this territory helped to a certain extent.

Railroads in many instances have but a scant supply of fuel, and in a few cases are enabled to operate only through the co-operation of connecting lines.

In New York City and vicinity, due largely to adverse weather conditions, coal is extremely difficult to obtain, and practically no stocks are on hand, particularly in the yards of retail dealers.

Efforts to secure river coal at Pittsburgh were temporarily successful, and it was thought that a large part of the city's difficulties had been surmounted, when a new cold wave struck that region and undid the work which had been accomplished in the shape of opening the lower pools of the Monongahela. The warm weather which had preceded the cold wave had, however, loosened up the car situation to a considerable extent and car supplies the first day or two of this week were better than formerly.

The coal trade in the Middle West is still operating under great difficulties imposed by the excessive snow-fall in the past few weeks. Traffic conditions are extremely bad, and mine operation is likewise.

From all over the country come reports of industries cleaning their bins of fuel, and in many cases being down to bare boards. Certain plants have been forced to shut down, while others are only able to keep running on a hand-to-mouth basis through special orders of the local fuel administrators. The domestic situation is scarcely less serious, and the suffering in homes is intense.

It is not believed that these conditions will permanently and entirely right themselves until warmer weather has relieved the adverse conditions under which the transportation of the country is now laboring.—*Coal Age.*

—

Blood Officers Re-elected

KALAMAZOO, Feb. 6—All of the officers and directors of Blood Bros. Co. have been re-elected. They are: President, L. H. Mattingly; vice-president, O. S. Cross; secretary-treasurer, R. G. Urch; directors, the officers and F. S. Chichester, L. L. Thompson and C. E. Parson.

Olds Chairman of Kardell Truck

ST. LOUIS, Feb. 4—R. E. Olds of the Reo Motor Car Co., has been appointed chairman of the board of directors of the Kardell Tractor & Truck Co. The principal factory of this company will be in St. Louis, and the engines will be manufactured in Lansing. Some tractors for southern use will be made at Oldsmar, Fla. The tractor will be styled "Four-In-One."

—

Harry Krause, formerly with the Wire Wheel Corp. of America, has been made assistant general manager in charge of production of the Splitdorf Electrical Co., Newark, N. J.

—

G. F. Knowles, sales engineer of the Federal Motor Truck Co., Detroit, is leaving for Washington, D. C., where he will handle sales engineering and all business of the Federal company with the government for the duration of the war.

—

Thomas S. Watson, president of the Thomas S. Watson Co., has received the commission of major in the Ordnance Officers' Reserve Corps. He left for Washington last week.

—

Major Frank R. Bacon, president of the Cutler-Hammer Mfg. Co., Milwaukee, formerly in charge of the New Haven (Conn.) District of the Ordnance Officers' Reserve Corps, has been transferred to Washington.

—

H. F. Harris has resigned his position as assistant branch manager of Willys-Overland Inc., New York., and on Feb. 15 will become industrial engineer of the Republic Motor Truck Co., Alma, Mich.

—

George K. Parsons has been appointed manager of the new Detroit branch factory of L. V. Flechter & Co. and will have charge of all factory sales. He was formerly national distributer of the Disco Self Starter Corp. and connected with the sales organization of the Ford Motor Co.

Men of the Industry

Changes in Personnel and Position

—

Kenneth Moller has resigned from the William Whitman Co., Inc., Boston, to enter Government service.

—

C. E. MacConnell has been added to the staff of sales engineers of the Hyatt Roller Bearing Co., Detroit. He was formerly advertising manager of the Detroit branch of the Goodrich Rubber Co.

—

M. D. Davidson has been appointed sales manager of the truck division of the Lau Iron Works Co., Youngstown, Ohio.

—

William H. Alexander, assistant general manager of the Marvel Carbureter Co., Flint, Mich., who was in charge of experimental work in the engineering department, has been called to serve in the aviation section of the Signal Corps.

—

William D. Paine, York, Pa., who has been Eastern district sales manager for the Saxon Motor Car Co. for the last 10 months, has been commissioned a captain in the Ordnance Officers' Reserve Corps and is awaiting his call to active service.

Botterill N. A. D. A. Vice-President

DENVER, Feb. 4—Tom Botterill, veteran motor car dealer, has been chosen Colorado vice-president of the National Automobile Dealers' Association to serve the unexpired term of Walter J. Haughey, who has resigned. Botterill is Pierce and Hudson distributer for Colorado and adjacent territory and Dodge dealer for Denver and vicinity, and Haughey is sales manager of the MacFarland Auto Co., Buick distributer for Colorado and Wyoming.

—

Ralph C. Smith has resigned as Eastern sales manager of the Reo Motor Car Co. to become sales manager of the Anderson Tire Mfg. Co., Washington, D. C.

—

William M. Crotty, for 7 years manager of the Chicago branch of the New York Lubricating Oil Co., has been appointed sales manager of the motor oil department of the Continental Oil Products Co., Chicago.

—

A. A. Lightfoot has been promoted from the position of Pennsylvania representative of the Marathon Tire & Rubber Co. to that of division manager at Chicago. He succeeds H. F. Smith, who has resigned.

—

V. K. McBride, former assistant sales manager of the Federal Motor Truck Co., has been appointed a captain in the Ordnance Department at Washington.

E. M. Sanders Dies

ST. LOUIS, Feb. 4—Ed. M. Sanders, for several years western representative of the Moon Motor Car Co., died suddenly of heart disease in Los Angeles, Jan. 26. Mr. Sanders formerly was in the motor car business in this city.

First Class AA ¾-Ton Trucks Practically Ready

(*Continued from page* 317)

is to enable the Post Office Department to use a slightly smaller engine, as the 42 hp. of the 4-by-5 cylinders is considered too large for ordinary post-office work. It may be said in this connection that the undefined rumors to the effect that the Post Office Department will not use any of the standardized war trucks certainly does not apply, at least to the Class AA job, since the Post Office officials and engineers were considered in its design and their recommendations incorporated into the construction laid out.

Aside from the large component parts which were shipped to each of the assemblies by the parts concerns, each assembler furnished a large number of small units such as the brake-rod assembly, clutch-pedal assembly, the fabric universal joint spiders, spring bolts and the like. The Willys-Overland company furnished 130 extra parts in all including spring bolts, pads, clutch and brake pedal units, bumper, draw-bar, etc., exclusive of the wiring system. The Maxwell company supplied a large number of forgings and the spring hangers. Each assembler himself provided small brackets, the spark and control assemblies and a thousand and one small parts which go to make up the completed vehicle.

Will Drive Trucks Overland

According to the plans made known at this writing, it is intended to drive each of the trucks overland to Washington. The Reo job has a Q. M. C. body made by the Auto Body Co., Lansing, Mich., and the Federal job a body made by the C. R. Wilson Co., Detroit.

It is expected that as soon as the vehicles reach Washington and undergo satisfactory tests similar to those performed on the Class A and B trucks, they will be ordered in large quantities. It is expected that the Medical Corps and perhaps the Post Office Department will place the initial orders.

The AA truck can be made in great quantities, and as an indication of the production which can be had with these trucks, Walter E. Flanders of the Maxwell company volunteered the information that his company could build 100 of the trucks a day provided a sufficient number of the parts were made available.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

Saginaw Malleable Co. Doubles Capacity

SAGINAW, MICH., Feb. 5—The Saginaw Malleable Co. will double its capacity to take care of war contracts by the installation of a new smelting furnace. This will add about 100 more workmen to the 250 already employed.

At the annual meeting of the company held this week the following directors were re-elected: E. J. Lobdell, Henry T. Robinson, George H. Hannum, James J. Kerns, Charles T. Kerry, W. J. Wickes, C. F. Drozeski, who will meet within a few days to elect officers. The present officers are: President and general manager, Charles F. Drozeski; vice-president, W. J. Wickes; treasurer, George H. Hannum, and secretary, Julius B. Kirby. It is probable that they will be re-elected.

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Larger Quarters for Improved Gauge

SYRACUSE, N. Y., Feb. 4—The Improved Gauge Mfg. Co. has moved to a larger factory at Canal and State streets. The company will increase its production also.

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Reliance Truck Starts New Plant

APPLETON, WIS., Feb. 5—The Reliance Motor Truck Co., formerly styled Racine Motor Truck Co., has started the construction of the first unit of its proposed new plant here. This will be 76 x 300 ft. It is expected that the work will be completed by May 15.

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Farm Tractor Now Fond du Lac

FOND DU LAC, WIS., Feb. 5—The Farm Tractor Co., manufacturer of farm tractors and power machinery, has changed its corporate style to Fond du Lac Tractor Co. to avoid confusion arising from the former style.

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Four Wheel Drive Truck Starts Work

WEBBERVILLE, MICH., Feb. 7—The plant of the Four Wheel Drive Truck Co., a company organized about 6 months ago with $50,000 capital, is now completed and the manufacture of the first 2-ton truck is under way. The officers of the company follow: President and assistant treasurer, Ashmon Catlin; secretary and manager, Frank Young of Webberville; vice-president, F. D. Welfare; treasurer, W. W. Thorbun.

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Reed Mfg. Co. Elects Directors

KALAMAZOO, MICH., Feb. 7—At the annual meeting of the Reed Mfg. Co., maker of the Reed tractor and steel castings, the following board of directors were elected: Joseph E. Brown, H. C. Lutje, E. H. Smith, B. W. Raseman and J. E. Welborn, Kalamazoo, and E. E. Reed, Oakfield, N. Y. The officers are: President, Joseph E. Brown; vice-president, H. C. Lutje; secretary, J. E. Welborn, and treasurer, B. W. Raseman.

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Service Truck Elects Officers

INDIANAPOLIS, Feb. 5—At the annual meeting of the Service Motor Truck Co., Wabash, Ind., last week a 3 per cent dividend was declared. Reports show a business of $3,500,000 for the year. Fred B. Walter was elected president of the company; Alex Pence, vice-president; Mole Cook, secretary, and Edward Bridges, treasurer.

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Columbia Motors to Make Government Trailers

DETROIT, Feb. 4—The Columbia Motors Co., maker of the Columbia 6-passenger cars, has received a big Government order for trailers, with instructions to begin shipments to France as quickly as possible.

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Detroit Aero Club Organized

DETROIT, Feb. 4—The National Aero Model Club has been organized here for the purpose of discussing aviation and solving airplane problems. The officers are: V. C. Babcock, president; A. H. Rembowski, L. Lindblom and E. L. Biechell, vice-presidents, and P. Van Ostenburg, secretary.

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Capital Increases

SYRACUSE, N. Y., Feb. 5—The Smith Wheel Co., Inc., has increased its capital from $1,000,000 to $3,000,000 and will build several additions to its plant.

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STOCKTON, CAL., Feb. 5—The Holt Mfg. Co. will sell 3968 shares of preferred stock for $396,800 and 5000 shares of common stock for $500,000, the proceeds to be used for the extension and improvement of its plant here and the one at East Peoria, Ill.

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DECATUR, ILL., Feb. 7—The Comet Automobile Co. has increased its capital from $1,000,000 to $3,000,000.

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UTICA, N. Y., Feb. 5—The Genesee Motor Car Co. has increased its capital from $5,000 to $100,000.

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SYRACUSE, N. Y., Feb. 5—The Sanford Motor Truck Co. has increased its capital from $50,000 to $250,000.

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CLINTONVILLE, WIS., Feb. 2—The Four Wheel Drive Automobile Co. has increased its capital from $1,000,000 to $2,000,000.

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LA CROSSE, WIS., Feb. 5—The La Crosse Tractor Co. has increased its capital from $1,500,000 to $2,500,000. The company is working at maximum capacity with a force of 400 men. Within the last year it has doubled its output and is now making extensive additions to its plant.

New Companies Formed

Latest additions to ranks of Automotive Industries

Will Make Airless Tires

KITTANNING, PA., Feb. 6—The Triple Airless Tire Co., a new company capitalized at $500,000, will break ground for its factory next month. The plant will be on a 5-acre lot, and when in operation, 250 men will be employed and 500 tires manufactured daily. Officers have been elected as follows: President, M. Martin, who is also president of the First National Bank, Grove City; A. C. Heilman, vice-president; Fred Daugherty, secretary and treasurer. A. M. McManus, Eau Claire, Wis., has been appointed general sales manager, and the board of directors include Eli Diekel, Ed. Aiken and Sam Sherman.

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Suelflohn & Seefeld Add "Co."

MILWAUKEE, Feb. 4—The Suelflohn & Seefeld Co. has been formed with $300,000 capital, to succeed the partnership business of Suelflohn & Seefeld. The company makes motor car supplies, accessories, hardware, etc. The incorporators are Gustave A., Henry F. and Clarence A. Seefeld.

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Super-Size Cord Tires Coming

INDIANAPOLIS, Feb. 5—A company headed by P. P. Parker is being organized here to manufacture super-sized cord tires exclusively. The company will be styled Parker Tire & Rubber Co. The organization of the company is well under way. The plant will be located in Indianapolis.

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Dividends Declared

The Standard Oil Co. of New York has declared the regular quarterly dividend of $3 a share, payable March 15 to stock of record Feb. 21.

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Four Wheel Drive Automobile Co., Clintonville, Wis., at its annual meeting declared a stock dividend of 50 per cent. The company is filling a contract for Government military trucks involving about $50,000,000. The dividend increases the capital stock of the corporation from $1,000,000 to $2,000,000. A year ago the capital was increased from $500,000 to $1,000,000. At the meeting J. D. Cotton was elected a director to fill the vacancy caused by the death of John Kalmes, treasurer, several months ago.

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The Union Carbide & Carbon Co. has declared a dividend of $1 a share on its 3,000,000 shares of common stock, payable April 2 to stock of record March 9.

India Now Good Motor Vehicle Market

High Freight Rates and 82 Cent Gasoline No Deterrent—Big Export Field Opening

BOMBAY, INDIA, Nov. 28, 1917—There is a great demand for automobiles of all kinds in India at present, in spite of the high cost of gasoline, which averages 82 cents a gallon. A government act of 1916 prohibits the importation of motor cars, motorcycles and trucks except for use of the government and persons who have special licenses, but this act will be repealed as soon as the war ends.

Consequently, an unprecedented importation of motor vehicles is expected, not only because the present supply is far less than the demand, but also because native merchants are enjoying a period of prosperity. In addition, the population of India, and Bombay in particular, is increasing rapidly, and the present means of transportation are inadequate.

On account of the great demand and high freight rates prices are high. A Ford car sells for the equivalent of $1,100 and the Scripps-Booth 2-passenger, advertised for $935 in the United States, brings $1,600. Freight, which costs $123.28 a ton via New York and the Asiatic or City Lines to Bombay, naturally hurts the cheap car more than the expensive one.

Streamline Bodies Popular

Residents of Bombay who are in the market for passenger cars prefer the streamline, torpedo body. French gray is the most popular color, with dark shades a close second. Many natives like gaudy colors and have their cars painted to suit themselves. As a result, some startling effects of combined blue and scarlet, orange and black, peagreen and lavender and pink and sky-blue may be seen here.

Cars should have a one-man top, covered with good waterproof khaki, as the monsoon rains beat their way through an ordinary top leather upholstery and brass trimmings are best. The native helper loves any work which he can perform while sitting down and will polish bright work by the hour. As little discretion is used in the selection of a polish, a nickel finish will soon disappear.

Most people in India prefer the touring body, and if there are extra seats these should face the rear seat. The latter, to please the native, must be wide and low, with deep upholstery.

Two Brakes Necessary

The motor laws of Bombay require two brakes, hand and foot, on the rear wheels, two head lamps, tail lamp, and side lamps which throw light on the center of the front fenders. Headlights must be dimmed for city driving and no mechanical or electric horns may be used. In spite of the fact that the left-hand drive is customary in England, India prescribes the right-hand drive, although there are a few instances of left-hand drives being permitted by the police.

In regard to engines, the 4-cylinder engine, 15-20 h.p., with detachable head and overhead valves, is most used. Gear boxes should be separate units and installed in the middle of the chassis. High-tension magnetos are demanded and electric starters are coming into vogue, as most dealers have fully-equipped repairshops and can take care of electric equipment.

Small Gear Ratios

Bombay's topography makes small gear ratios, from 3½-1 to 4-1, necessary, and normal tread cars with chucker tires in metric sizes are most desired.

At present 1½, 4 and 6-ton trucks are popular, the two larger sizes being used for the transport of cotton. These have chain drive and the smallest size worm drive. As Bombay is very hot, extra large radiators with fan and pump are necessary. Tail and side lamps are required, the latter used to show as far as possible the width of the car, which is limited to 6 ft. 7 in. Trucks should have demountable, solid tires.

At present there are 12 agencies in Bombay carrying 19 American cars and 4 American trucks, and 11 agencies for 23 foreign cars and 5 trucks. Seven makes of tires are sold, each by a separate agency.

The complete list follows:

American Cars

Name	Agent
Overland and Willys-Knight	A. Hyland
Briscoe	A. H. Wheeler & Co.
Chevrolet and Oakland	Bombay Garage
Ford	Ford Automobiles, Ltd.
Pullman	Omiar Motor Works
Metz	L. Roysampat
Buick and Saxon	Hill, Sawyer & Co.
Studebaker	French Motor Car & Electric Co.
Moline-Knight,	French Motor Car & Electric Co.
Hudson and Regal	Bombay Motor Car Co.
Dodge	Bombay Cycle & Motor Agency
Scripps-Booth, Chalmers and Maxwell,	The Automobile Co., Ltd.
Oldsmobile	Hormusji Sorabji

Trucks

Garford	Hill, Sawyer & Co.
Federal	French Motor Car & Electric Co.
General Motors	Bombay Motor Car Co.

Foreign Cars

Sunbeam, Austin, B. S. A., Morris, Cowley,	A. Hyland
Calthorpe	A. H. Wheeler & Co.
Napier, Metallurgique	Marcks & Co.
Woolesley, Vickers	Woolesley Motors, Ltd.
Alpha	Ford Automobiles, Ltd.
Rolls-Royce	Rolls-Royce, Ltd.
Crossley	F. W. Barlow
Mors, Minerva, Berliet,	French Motor Car & Electric Co.
Panhard, Bianchi,	French Motor Car & Electric Co.
Rover, Daimler, Fiat	Bombay Motor Car Co.
Charron, Swift	The Automobile Co., Ltd.

Foreign Trucks

Halley	Automobile Co., Ltd.
Thorneycroft, Stellute, Woolesley	A. Hyland
Dennis Bros.	Turner, Hoare & Co.

Tires

Goodyear	Goodyear Tire & Rubber Co.
Goodrich	F. & L. Barraclough
Michelin	French Motor Car & Electric Co.
Dunlop	Dunlop Rubber Co.
Avon	L. Rochat & Co.
Wood-Milne	Turner Morrison & Co.
Dayton Airless	P. Muncherji

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War Trade Board Issues New Rulings

WASHINGTON, Feb. 1—American corporations, established and doing business in neutral or allied countries, have been authorized by the War Trade Board:

1. To receive in payment of indebtedness, and to collect drafts or checks drawn or endorsed by "enemies" or "allies of enemies" where refusal to accept the same may result in failure to collect the debt.
2. To pay drafts or checks drawn in favor of, or endorsed by, "enemies" or "allies of enemies" where refusal to pay the same will result in a violation of law or commercial obligation;
3. To receive for collection drafts or checks drawn by, or accepted, or endorsed by "enemies" or "allies of enemies;" and
4. To become a party to clearing house transactions in the ordinary course of business where an "enemy" or "ally of enemy" may be a member of such clearing house.

Report Each Transaction

A written report of every such transaction of trade with the "enemy" or "enemy allies" shall be mailed to the War Trade Board, Wahington, D. C., on the fifth day of each month, covering the transactions of the preceding calendar month under 1, 2 and 3 above. Such report must state the dates of the respective transactions, the respective names of the drawers, drawees and endorsers, and the respective amounts of the drafts and checks involved. Any United States corporation or other American house joining a clearing house under 4 above shall immediately mail to the War Trade Board, Washington, D. C., a statement of the facts in the case.

Likewise the War Trade Board has authorized branches of American corporations and other American houses established and engaged in business in neutral countries, or in countries associated with the United States in the war, in cases where a lease has been made without knowledge of the "enemy" character of the tenant or landlord, as the case may be:

1. To receive rent from "enemies" or "allies of enemies" where refusal to accept the same will result in failure to collect the debt;
2. To pay rent to "enemies" or "allies of enemies" where refusal to pay the same will result in forfeiture of the lease or damages.

A report of every such lease shall be mailed to the War Trade Board, Washington, D. C., after the discovery of such "enemy" interest. Such report shall state the date when the lease was made, the date when the lease expires, the amount of rental payable, the name or names of the "enemy" tenant or landlord, as the case may be.

11 More Michigan Plants Exempted

LANSING, MICH., Jan. 31—In addition to those concerns previously exempted from the closing order in Michigan on Monday of every week until further notice, State Fuel Administrator W. K. Prudden has announced further exemptions. These include the Champion Ignition Co., Flint; Hayes Motor Truck Wheel Co., St. Jones; Jackson Motor Shaft Co., Jackson; Mason Motor Co., Flint; Muskegon Motor Specialties Co., Muskegon; Keller Brass Co., Grand Rapids; Lewis Spring & Axle Co., Chelsea; Jackson-Church-Wilcox Co., Saginaw; General Motors Co. and the Weston-Mott Co., Flint, and the Republic Motor Truck Co., Alma.

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Hartford Auto Parts Elects Directors

HARTFORD, CONN., Feb. 3—At the annual meeting of the Hartford Auto Parts Co. last week the following directors were elected for one year: J. H. Trumbull, Trumbull Electric Co., Plainville, Conn.; C. C. Chamberlain, Blakeslee Forging Co., Plantsville, Conn.; H. H. Ensworth, L. L. Ensworth & Sons Co., Hartford, Conn.; M. J. Unkelbach, Unkelbach & Perry, architects, New Britain, Conn.; J. M. Carney and H. W. Bigelow, Hartford Auto Parts Co. The old board of directors was re-elected at the meeting and the regular quarterly dividend of 1½ per cent, payable Feb. 15, was declared.

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AA Truck Assemblers to Deal with Parts Makers

WASHINGTON, Feb. 2—The Motor Transport Section of the Quartermaster Corps plans to issue contracts for the assembling of Class AA trucks in a manner similar to that used for the assembling of Class A trucks. This means that the assemblers will deal directly with the parts makers.

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Airplane Production Offices in Cleveland

WASHINGTON, Feb. 2—Major Harry Shepler, formerly vice-president of the Willys-Overland Co. and now in charge of production for the aviation section of the Signal Corps, is moving his offices to Cleveland and will have charge of government aviation production. In Cleveland he will better be able to supervise airplane work, as a majority of the factories are located in that section.

Unite to Clear Roads

LANSING, MICH., Feb. 5—The Olds Motor Works, the Reo Motor Car Co., and the Auto Body Co. have joined hands, at least temporarily, to form what might be called a snow-shoveling brigade. More than 100 men are now occupied in clearing the roads from Lansing to Detroit, so that cars and bodies may be shipped overland to Detroit and then connect with the military motor truck road from Detroit to Cleveland and Toledo.

Shipping conditions during the last 10 days have become so acute that these concerns had to lease warehouse space, as their plants were being filled with the finished product, which could not be shipped. A few days ago the Reo Motor Car Co. leased part of the Owosso Sugar Co. plant to store 200 trucks and cars. At the Olds Motor Works it was stated that it is not possible to get freight cars and owing to the bad weather passenger cars can hardly be moved by the usual driveway plan. The Auto Body Co., which is furnishing bodies to the Scripps-Booth Co. of Detroit, is also unable to make shipments. It is for these reasons that these companies have combined.

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Calendar

ASSOCIATIONS

Feb. 4-7—St. Louis, American Road Builders' Assn. Convention.

April 18-20 — Cincinnati, Fifth National Foreign Trade Convention.

June 5-12—Hot Springs, Va. National Assn. Automobile & Accessory Jobbers.

SHOWS

Feb. 5-9—Greensburg, Pa., Westmoreland Automobile Dealers' Association.

Feb. 5-9 — Twin City Auto., Truck, Tractor and Industrial Exposition, Overland Bldg., Minneapolis Auto Trade Assn. Walter B. Wilmot, Mgr.

Feb. 5-9 — Kalamazoo, Mich., Kalamazoo Automobile Dealers' Assn., Armory.

Feb. 5-9—Binghamton, N. Y. Binghamton Automobile Dealers' Assn., Kalurah Temple. William M. McNulty, Mgr.

February — Peoria, Ill., Peoria Auto and Accessories Dealers' Assn. W. O. Ireland, Mgr.

Feb. 6-9—Lancaster, Pa., Automobile Track Assn., Fidelity Bldg. R. W. Screiner, Mgr.

Feb. 7-13—Portland, Ore., Ninth Annual Dealers' Motor Car Assn., Auditorium. M. O. Wilkins, Mgr.

Feb. 9-16 — Bronx, N. Y., 2d Battery Armory, Bronx Automobile Dealers' Assn. D. J. Barrett, Mgr.

Feb. 11-16—Elmira, N. Y., Elmira Automobile Club. State Armory.

Feb. 11-16 — Kansas City, Mo., Kansas City Motor Car Dealers' Assn., Convention Hall. E. E. Peake, Mgr.

Feb. 11-16—Kansas City, Mo., Third Annual National Tractor Show.

Feb. 11-17 — Toledo, Terminal Auditorium. Toledo Auto Show Co.

Feb. 13-16 — Ft. Wayne, Ind., Automobile Trade Assn., Concordia Gymnasium.

Feb. 16-23—St. Louis, Mo., St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Mgr.

Feb. 16-23—Albany, N. Y., Albany Auto Dealers' Assn., State Armory.

Feb. 16-24—San Francisco, Cal., San Francisco Dealers' Assn., Exposition Auditorium. G. A. Wahlgreen, Mgr.

Feb. 18-23—Syracuse, N. Y. Syracuse, Automobile Dealers' Assn., State Armory. Harry T. Gardner, Mgr.

Feb. 18-23 — Nashville, Tenn., Nashville Auto Trade Assn., Hippodrome. Henry B. Marks, Mgr.

Feb. 18-23—Grand Rapids, Mich., Automobile Business Assn., Klingman Building. Ernest T. Conlon, Mgr.

Feb. 18-23—Newark, N. J., N. J. Auto Exhibition, Co. G. First Regiment Armory Claude E. Holgate, Mgr.

Feb. 18-23 — Springfield, Ohio, Springfield Auto Trades Assn., Memorial Hall. C. S. Burke, Mgr.

Feb. 18-23 — Waterbury, Conn., United Shows Co.

Feb. 18-23—Duluth, Minn., Duluth Automobile Trade Association. John J. Lane, Mgr.

Feb. 18-23 — Pittsfield, Mass., State Guard, State Armory. James J. Callaghan, Mgr.

Feb. 18-27—So. Bethlehem, Pa., Fourth Annual (cars 18-23; trucks 25-27), Coliseum, J. L. Elliott, Mgr.

Feb. 20-23—Quincy, Ill., First Annual. Armory. L. B. Bartlett, Mgr.

Feb. 23-Mar. 2—Brooklyn, N. Y., Brooklyn Motor Vehicle Dealers' Assn., 23d Regiment Armory. I. C. Kirkham, Mgr. Passenger cars Feb. 23-Mar. 2; Trucks, Mar. 5-9.

Feb. 23-Mar. 2—Omaha, Neb., Omaha Auto. Trade Assn. Auditorium. Clarke G. Powell, Mgr.

Feb. 25 - Mar. 2—Indianapolis, Indianapolis Automobile Trade Assn., Diamond Chain Work Bldg. John B. Orman, Mgr.

Feb. 25-Mar. 2—Muskegon, Mich. Second Annual, Merrill Auditorium. John C. Fowler, Mgr.

Feb. 27-Mar. 2—Columbus, O., Auto Exhibitors' Co. W. W. Freeman, Mgr.

Feb. 27-Mar. 2 — Burlington, Iowa. Cars, Trucks & Accessories.

Feb. 27-Mar. 6—Boston, Mass., Salon, Boston Automobile Dealers' Assn., Copley Plaza Hotel. Chester I. Campbell, Mgr.

Mar. 1-15—Lyons, France, Third Sample Fair.

Mar. 2-9—Boston, Mass., Boston Auto Dealers' Assn., Mechanics' Bldg. Chester I. Campbell, Mgr.

Mar. 2-9—Pittsburgh, Pa., Automobile Dealers' Assn. of Pittsburgh, Motor Square Garden. John J. Bell, Mgr.

Mar. 4-9—Utica, N. Y., Utica Motor Dealers' Association, Inc., State Armory.

Mar. 6-9—Clinton, Ia., Clinton Automobile Dealers' Assn., Coliseum.

Mar. 6-9—Raleigh, N. C., Auditorium. John Kelley, Mgr.

Mar. 6-9—Watertown, N. Y., Automobile Dealers, Inc., State Armory. Arthur E. Sherwood, Mgr.

Mar. 6-9—Mason City, Iowa. Annual Car and Truck. Automobile Dealers' Assn.

Mar. 6-9—St. Joseph, Mo., St. Joseph Automobile Dealers' Assn., Auditorium. John Albus, Mgr.

Mar. 6-9—Sioux Falls, S. D., S. D. Automobile Dealers' Assn.

Mar. 8-11 — Green Bay, Wis., Brown County Automobile Trade Assn.

Mar. 11-16—Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.

Mar. 12-15—Fargo, N. D., Gate City Auto. Show Co., Auditorium. J. W. Murphy, Mgr.

Mar. 14-16—Fort Fairfield, Me., Reed's Garage. R. F. Reed, Mgr.

Mar. 15-20—Great Falls, Mont., Montana Automobile Distributors' Association, Lexington Garage. A. J. Breitenstein, Mgr.

Mar. 19-23—Vancouver, B. C., Western Canada Automobile Show Assn., Horse Show Bldg. D. A. Hamilton, Mgr.

Mar. 19-24—San Francisco, Cal., Motor Truck Dealers of San Francisco, Auditorium. Ivan R. Gates, Mgr.

Mar. 20-22—Houlton, Me., Second Annual, Houlton, Motor Car Dealers' Assn., Bangor St. Exhibition Hall. J. D. Luth, Mgr.

Mar. 20-23 — Holdredge, Neb., Second Annual of Southwest Nebraska.

Mar. 20-23 — Trenton, N. J., Trenton Auto Trade Assn., Second Regiment Armory. John L. Brock, Mgr.

Mar. 25-30—Bridgeport, Conn., Fourth Regiment Conn. Home Guard State Armory and Casino. B. B. Steiber, Mgr.

Mar. 30-Apr. 6—Hartford, Conn., Eleventh Annual, Hartford Automobile Dealers' Assn., Inc. State Armory. B. F. Smith, Mgr.

Mar. 30-Apr. 6 — Atlantic City, N. J. Second Annual. Garden Pier. S. W. Megill, Mgr.

Apr. 6-13 — Red Bank, N. J., Monmouth County Auto. Dealers' Assn., Armory. E. C. Von Kattengell, Mgr.

Apr. 9-13—Stockton, Cal., Third Annual San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.

Apr. 17-20—Calumet, Mich., Upper Peninsular Show, Copper County Automobile Dealers & Garage Owners' Assn., Coliseum.

Sept. 23-28 — Chicago, National Accessory Show for Fords, Coliseum.

ENGINEERING

American Society of Heating and Ventilating Engineers.

Mining and Metallurgical Society of America.